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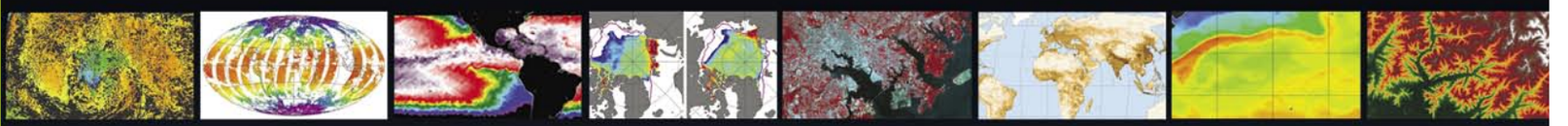


Earth System Science Data Resources

Tapping into a wealth of data, information, and services

Contents

Section 1

From the vantage point above Earth, we can view our Sun and Earth as a whole system, observe the results of complex interactions, and begin to understand how our star and planet are changing. Working with its domestic and international partners, NASA provides accurate and objective scientific data and analysis to advance our understanding of Earth–Sun system processes.

Learning more about these processes will enable improved prediction capability for climate, weather, and natural hazards. By studying our Sun and Earth as a system, and employing an end-to-end strategy to assure that all the information, understanding, and capabilities derived from its research are fully realized, NASA is striving to develop a scientific understanding of the Earth–Sun system and its response to natural or human-induced changes.

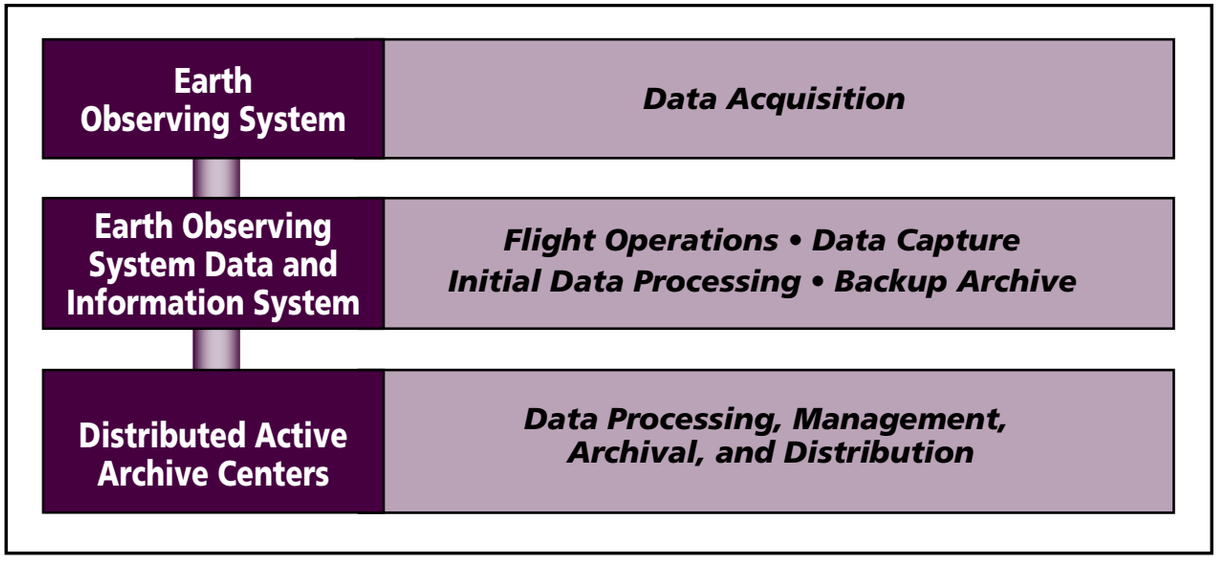
NASA's Earth system science data component of the Earth–Sun System Division provides more than 2,400 data products and associated services for interdisciplinary studies. The Earth Observing System Data and Information System (EOSDIS) manages and distributes these products through the Distributed Active Archive Centers (DAACs). These data centers process, archive, document, and distribute data from NASA's past and current Earth system science research satellites and field programs. Each center serves one or more specific Earth science disciplines and provides its user community with data products, data information, services, and tools unique to its particular science.

Presently, EOSDIS supports the daily production of over 2 terabytes (TB) of interdisciplinary Earth system science data. These data are either from EOS missions (e.g., ACRIMSAT, Aqua, Aura, ICESat, Jason, QuikSCAT, SORCE, Terra), pre-EOS missions (e.g., SeaWiFS, TOMS-EP, TOPEX/POSEIDON, TRMM, UARS), other Earth system science data (e.g., Pathfinder data sets), NASA funded field campaigns (e.g., BOREAS, FIFE, SAFARI), and human dimensions derived data (e.g., China Dimensions Data Collection, GRUMP). An excess of 4 petabytes (PB) of data products that cover a wide range of physical, geophysical, biochemical, and other parameters are archived at the nine EOSDIS data centers.

In 2004 alone, over 34 million Earth system science data products, 640 TB (~1.8 TB daily) of data and information about NASA missions, instruments, and data products, was disseminated to over 2 million distinct users within the science, government, industry, education, and policy maker communities. These data are collected by approximately 65 instruments onboard more than 40 satellite and aircraft platforms.

NASA uses the unique vantage point of space to understand and explore our home planet and star in order to achieve our vision: To improve life here, extend life to there, and find life beyond. Through exploration and discovery, NASA answers scientific questions as old as humanity itself and asks new ones, making the world smarter, healthier, and safer.

The following figure depicts the hierarchical relationship and responsibilities of EOS, EOSDIS, and the Distributed Active Archive Centers (DAACs) as one component of NASA's Earth–Sun System Division.



Section 2

Types of Remote Sensors

Remote sensing instruments are of two primary types—passive and active. Passive sensors detect natural energy (radiation) that is emitted or reflected by the object or scene being observed. Reflected sunlight is the most common source of radiation measured by passive sensors.

Active sensors, on the other hand, provide their own source of energy to illuminate the objects they observe. An active sensor emits radiation in the direction of the target to be investigated. The sensor then detects and measures the radiation that is reflected or backscattered from the target.

Passive and active remote sensors are described in the following paragraphs.

Passive Sensors

Passive sensors include different types of radiometers and spectrometers. Most passive systems used in remote sensing applications operate in the visible, infrared, thermal infrared, and microwave portions of the electromagnetic spectrum. Passive remote sensors include the following:

- ***Radiometer***—An instrument that quantitatively measures the intensity of electromagnetic radiation in some bands within the spectrum. Usually, a radiometer is further identified by the portion of the spectrum it covers; for example, visible, infrared, or microwave. Microwave sensors are able to penetrate clouds and most rain, making them all-weather sensors.
- ***Imaging radiometer***—A radiometer that has a scanning capability to provide a two-dimensional array of pixels from which an image may be produced. Scanning can be performed mechanically or electronically by using an array of detectors.
- ***Spectrometer***—A device that is designed to detect, measure, and analyze the spectral content of incident electromagnetic radiation. Conventional imaging spectrometers use gratings or prisms to disperse the radiation for spectral discrimination.
- ***Spectroradiometer***—A radiometer that measures the intensity of radiation in multiple wavelength bands (i.e., multispectral). Many times the bands are of high-spectral resolution, designed for remotely sensing specific parameters such as sea surface temperature, cloud characteristics, ocean color, vegetation, and trace chemical species in the atmosphere and in snow and sea ice data.
- ***Hyperspectral radiometer***—An advanced multispectral sensor that detects hundreds of very narrow spectral bands throughout the visible, near-infrared, and mid-infrared portions of the electromagnetic spectrum. This sensor's very high-spectral resolution facilitates fine discrimination between different targets based on their spectral response in each of the narrow bands.
- ***Sounder***—An instrument that measures vertical distributions of atmospheric parameters such as temperature, pressure, and composition from multispectral information.

Active Sensors

The majority of active systems operate in the microwave portion of the electromagnetic spectrum, which makes them able to penetrate the atmosphere under most conditions. Active remote sensors include the following:

- ***Radar***—An active radio detection and ranging sensor that provides its own source of electromagnetic energy. An active radar sensor, whether airborne or spaceborne, emits microwave radiation in a series of pulses from an antenna. When the energy reaches the target, some of the energy is reflected back toward the sensor. This backscattered microwave radiation is detected, measured, and timed. The time required for the energy to travel to the target and return back to the sensor determines the distance or range to the target. By recording the range and magnitude of the energy reflected from all targets as the system passes by, a two-dimensional image of the surface can be produced. Because radar provides its own energy source, images can be acquired day or night. Also, microwave energy is able to penetrate clouds and most rain, making it an all-weather sensor.
- ***Scatterometer***—A high-frequency microwave radar designed specifically to measure backscattered radiation. Over ocean surfaces, measurements of backscattered radiation in the microwave spectral region can be used to derive maps of surface wind speed and direction.
- ***Lidar***—A light detection and ranging sensor that uses a laser (light amplification by stimulated emission of radiation) to transmit a light pulse and a receiver with sensitive detectors to measure the backscattered or reflected light. Distance to the object is determined by recording the time

between transmitted and backscattered pulses and by using the speed of light to calculate the distance traveled. Lidars can determine atmospheric profiles of aerosols, clouds, and other constituents of the atmosphere.

- ***Laser altimeter***—An instrument that uses a lidar to measure the height of the platform (spacecraft or aircraft) above the surface. The height of the platform with respect to the mean Earth's surface is used to determine the topography of the underlying surface.
- ***Sounder***—An instrument that measures vertical distribution of precipitation and other atmospheric characteristics such as temperature, humidity, and clouds.

NASA Earth System Science Remote Sensors

The following tables list and describe many of the passive and active remote sensors whose data are supported by EOSDIS. Some of these sensors may overlap categories. The Earth system science data centers archive and distribute these data. Data from some instruments are incorporated in data sets from field campaigns (e.g., BOREAS, FIFE, CAMEX-3 and -4). Section 4 provides information about the satellite and field campaign data holdings at each data center. (See Section 8 for the definitions of the acronyms and abbreviations used in these tables.)

Passive Sensors

Instrument	Type	Platform	Data Center	Comments
Single Channel/Total Power Radiometers and Imagers				
ACRIM II	Total power radiometer	UARS	LaRC	Measures total solar irradiance.
ACRIM III	Total power radiometer	ACRIMSAT	LaRC	Measures total solar irradiance.
TIM	Total power radiometer	SORCE	GES	Measures total solar irradiance.
LIS	Imager	TRMM	GHRC	Detects intra cloud and cloud-to-ground lighting, day and night.
WFC	Wide Field Camera	CALIPSO	LaRC	Fixed, nadir-viewing imager with a single spectral channel covering the 620-270nm region.
Multispectral Instruments				
AMSR-E	Multichannel microwave radiometer	Aqua	NSIDC	Measures precipitation, oceanic water vapor, cloud water, near-surface wind speed, sea and land surface temperature, soil moisture, snow cover, and sea ice. Provides spatial resolutions of 5.4 km, 12 km, 21 km, 38 km, and 56 km.
ASTER	Multispectral radiometer	Terra	LP	Measures surface radiance, reflectivity, emissivity, and temperature. Provides high-spatial resolutions of 15 m, 30 m, and 90 m.
AVHRR	Multispectral radiometer	NOAA POES	GES NSIDC	Has four or five bands, depending on platform. Telemetried resolutions are 1.1 km (HRPT data) and 4 km (GAC data).
CERES	Broadband scanning radiometer	Aqua Terra TRMM	LaRC	Has four to six channels (shortwave, longwave, total). Measures atmospheric and surface energy fluxes. Provides 20-km resolution at nadir.
IIR	Imaging Infrared Radiometer	CALIPSO	LaRC	Nadir-viewing, non-scanning imager having a 64 km swath with a pixel size of 1 km. Provides measurements at three channels in the thermal infrared window region at 8.7 mm, 10.5 mm, and 12.0 mm.
MAS	Imaging spectrometer	NASA ER-2 aircraft	GES, GHRC LaRC	Has 50 spectral bands. Provides spatial resolution of 50 m at typical flight altitudes.
MISR	Imaging spectrometer	Terra	LaRC	Obtains precisely calibrated images in four spectral bands at nine different angles to provide aerosol, cloud, and land surface data. Provides spatial resolution of 250 to 275 m.

Passive Sensors (continued)

Multispectral Instruments (continued)

Instrument	Type	Platform	Data Center	Comments
MODIS	Imaging spectrometer	Aqua Terra	GES LP NSIDC PO.DAAC	Measures many environmental parameters (ocean and land surface temperatures, fire products, snow and sea ice cover, vegetation properties and dynamics, surface reflectance and emissivity, cloud and aerosol properties, atmospheric temperature and water vapor, ocean color and pigments, and ocean biological properties). Provides moderate spatial resolutions of 250 m (bands 1 and 2), 500 m (bands 3–7), and 1,000 m (bands 8–36).
SSM/I	Multispectral microwave radiometer	DMSP mission	GHRC LaRC NSIDC PO.DAAC	Has seven channels and four frequencies. Measures atmospheric, ocean, and terrain microwave brightness temperatures at 19.35 GHz, 22.235 GHz, 37.0 GHz, and 85.5 GHz.
SMMR	Multichannel microwave radiometer	Nimbus-7	GES LaRC NSIDC PO.DAAC	Has 10 channels. Measures sea surface temperatures, ocean near-surface winds, water vapor and cloud liquid water content, sea ice extent, sea ice concentration, snow cover, snow moisture, rainfall rates, and differentiation of ice types.
Hyperspectral Instruments				
AVIRIS	Imaging spectrometer	Aircraft	ORNL	Has 224 contiguous channels, approximately 10 nm wide. Measurements are used to derive water vapor, ocean color, vegetation classification, mineral mapping, and snow and ice cover. (BOREAS Project)
SOLSTICE	Spectrometer	SORCE	GES	Measures the solar spectral irradiance of the total solar disk in the ultraviolet wavelengths from 115 to 430 nm.
Polarimetric Instruments				
POLDER	Polarimeter	Aircraft	ORNL	Measures the polarization and the directional and spectral characteristics of the solar light reflected by aerosols, clouds, and the Earth's surface. (BOREAS Project)
PSR	Microwave polarimeter	Aircraft	GHRC	Measures wind speed and direction. (CAMEX-3 Project)
Sounding Instruments				
AIRS	Hyperspectral radiometer	Aqua	GES	Measures air temperature, humidity, clouds, and surface temperature. Provides spatial resolution of ~13.5 km in the IR channels and ~2.3 km in the visible. Swath retrieval products are at 50-km resolution.
AMSU	Multichannel microwave radiometer	Aqua	GES GHRC	Has 15-channels. Measures temperature profiles in the upper atmosphere. Has a cloud-filtering capability for tropospheric temperature observations. Provides spatial resolution of 40 km at nadir.
HIRDLS	Multichannel	Aura	GES	Measures infrared emissions at the Earth's limb in 21 channels to obtain profiles of temperature, ozone, CFCs, various other gases affecting ozone chemistry, and aerosols at 1-km vertical resolution. In addition HIRDLS measures the location of polar stratospheric clouds.

Passive Sensors (continued)

Multispectral Instruments (continued)

Instrument	Type	Platform	Data Center	Comments
MLS	Multichannel microwave radiometer spectrometer	Aura, UARS	GES	Five broad band radiometers and 28 spectrometers measure microwave thermal emission from the limb of Earth's atmosphere to derive profiles of ozone, SO2, N2O, OH and other atmospheric gases, temperature, pressure, and cloud ice.
MOPITT	Correlation spectrometer	Terra	LaRC	Measures carbon monoxide and methane in the troposphere. Is able to collect data under cloud-free conditions. Provides horizontal resolution of ~22 km and vertical resolution of ~4 km.
OMI	Hyperspectral radiometer	Aura	GES	Has 740 wavelength bands in the visible and ultraviolet. Measures total ozone and profiles of ozone, NO2, SO2, and several other chemical species.
TES	Fourier transform spectrometer	Aura	LaRC	High-resolution imaging infrared Fourier-transform spectrometer that operates in both nadir and limb-sounding modes. Provides profile measurements of ozone, water vapor, carbon monoxide, methane, nitric oxide, nitrogen dioxide, and nitric acid.

Active Sensors

Instrument	Type	Platform	Data Center	Comments
Altimeters - Radar and Laser (Lidar)				
ALT	Radar altimeter	TOPEX/POSEIDON	PO.DAAC	Measures altimeter height of the satellite above the sea (satellite range), wind speed, wave height, and ionospheric correction.
CALIOP	Cloud and Aerosol Lidar	CALIPSO	LaRC	Two-wavelength polarization-sensitive lidar that provides high-resolution vertical profiles of aerosols and clouds.
GLAS	Laser altimeter	ICESat	NSIDC	Measures ice sheet and other surface topography, cloud height, and aerosol layer height. Provides vertical resolution of 75 to 200 m and horizontal resolution of 150 m to 50 km.
Poseidon-2	Radar altimeter	Jason-1	PO.DAAC	Measures sea level, wave height, and wind speed.
Scatterometers				
NSCAT	Radar scatterometer	ADEOS-I	PO.DAAC	Measured ocean vector wind data. Provided spatial resolutions of 25 km and 50 km. (9 months of data received before satellite failure)
Seasat (instrument and platform)	Radar scatterometer	Seasat	PO.DAAC	Measured ocean vector winds. (3 months of data received before satellite failure)
SeaWinds	Radar scatterometer	QuikSCAT ADEOS-II	PO.DAAC	Provides spatial resolution of ~6 by 25 km and 25-km resolution for ocean vector winds.
Imaging Radar/SAR				
SAR	Synthetic aperture radar	ERS-1 ERS-2 JERS-1 RADARSAT-1	ASF NSIDC	Provides high-resolution surface imagery at 30–240 m.
Sounding Instruments				
CLS	Lidar	ER-2	LaRC	Determines vertical cloud structure. (FIRE Project)
PR	Phased-array radar	TRMM	GES	Measures 3-D distribution of rain and ice. Provides horizontal resolution of 250 m and vertical resolution of 5 km.
VIL	Lidar	Ground	LaRC ORNL	Determines vertical cloud structure. (FIRE and BOREAS Projects)

Section 3

Data Products and Types

The data centers process, archive, and distribute EOSDIS data products. The products are data sets, or groups of data sets, derived from EOS instruments and other Earth system science measurement systems. They can be either standard data products (SDPs) or special data products.

Standard Data Products

Data products are considered to be standard data products (SDPs) if they are

- Generated as part of a research investigation using EOS data.
- Recognized to have wide research utility.
- Generated routinely.
- Produced for spatially and/or temporally extensive sets of data.

SDPs are produced at the DAACs or by Science Investigator-led Processing Systems (SIPSs). These products are formally defined in EOSDIS requirements documentation.

Special Data Products

Data products are considered to be special data products if they are

- Generated as part of a research investigation using EOS data.
- Produced for a limited region or time period.
- Not accepted as standard by the EOS Investigators Working Group (IWG) and NASA Headquarters.
- Referred to as "special data products" to distinguish them from other nonstandard products such as ancillary data sets.

Special data products are normally generated at the investigators' Scientific Computing Facilities (SCFs).

Data Processing Levels for Standard Data Products

EOSDIS SDPs are processed at various levels ranging from Level 0 to Level 4. Level 0 products are raw data at full instrument resolution. At higher levels, the data are converted into more useful parameters and formats. All EOS instruments must have Level 1 SDPs. Most have products at Levels 2 and 3, and some have products at Level 4.

The data processing levels described in the table below and referenced in the following sections are identical to the EOSDIS Data Panel's definitions and are consistent with the Committee on Data Management, Archiving, and Computing (CODMAC) definitions.

Data Level	Description
Level 0	Reconstructed, unprocessed instrument and payload data at full resolution, with any and all communications artifacts (e.g., synchronization frames, communications headers, duplicate data) removed. (In most cases, the EOS Data and Operations System (EDOS) provides these data to the DAACs as production data sets for processing by the Science Data Processing Segment (SDPS) or by a SIPS to produce higher level products.)
Level 1A	Reconstructed, unprocessed instrument data at full resolution, time-referenced, and annotated with ancillary information, including radiometric and geometric calibration coefficients and georeferencing parameters (e.g., platform ephemeris) computed and appended but not applied to the Level 0 data.
Level 1B	Level 1A data that have been processed to sensor units (not all instruments have Level 1B data).
Level 2	Derived geophysical variables at the same resolution and location as Level 1 source data.
Level 3	Variables mapped on uniform space-time grid scales, usually with some completeness and consistency.
Level 4	Model output or results from analyses of lower level data (e.g., variables derived from multiple measurements).

Data Format Descriptions

HDF

The Hierarchical Data Format (HDF) is designed to facilitate sharing of scientific data. HDF features include platform independence, user extendibility, and embedded metadata for units, labels, and other descriptors. Standard data types include multidimensional array, text, table, raster image, and palette. HDF files are portable, and they can be shared across most common platforms, including many workstations and high-performance computers. An HDF file created on one computer can be read on a different system without modification. HDF was developed by the National Center for Supercomputing Applications (NCSA). This format is extensible and can easily accommodate new data models, regardless of whether they are added by the HDF development team or by HDF users. For more information about HDF as a scientific data format, see http://hdf.ncsa.uiuc.edu.

HDF-EOS

The HDF for the Earth Observing System (HDF-EOS) data format is standard HDF with EOS Core System (ECS) conventions, data types, and metadata. HDF-EOS adds three geolocation data types (point, grid, and swath) that allow file contents to be queried by Earth coordinates and time. An HDF-EOS file also contains ECS core metadata essential for ECS search services. An HDF-EOS file can be read by any tool that processes standard HDF files. A data product need not fit any of the grid, point, or swath models to be considered HDF-EOS. If the product includes ECS metadata, it is a valid HDF-EOS file.

HDF-EOS is implemented as a C library extension of the standard HDF library (with FORTRAN bindings). This format ensures that data can be accessed by EOSDIS scientists and nonscientists from multiple disciplines. Use of HDF-EOS also can eliminate duplication of software development efforts, especially for analysis and visualization software. EOSDIS data providers must supply written justification for deviating from the HDF-EOS (or HDF) format.

netCDF

The network Common Data Form (netCDF) is an interface for array-oriented data access and a freely distributed collection of software libraries for C, FORTRAN, C++, Java, and Perl that provide implementations of the interface. The netCDF software was developed at the Unidata Program Center in Boulder, Colorado, and augmented by contributions from other netCDF users. The netCDF libraries define a machine-independent format for representing scientific data. Together, the interface, libraries, and format support the creation, access, and sharing of scientific data.

netCDF data have the following features: (1) self-describing—a netCDF file includes information about the data it contains; (2) architecture-independent—a netCDF file is represented in a form that can be accessed by computers with different ways of storing integers, characters, and floating-point numbers; (3) directly accessible—a small subset of a large data set may be accessed without the need to first read through the preceding data; (4) appendable—data can be appended to a netCDF data set along one dimension without copying the data set or redefining its structure; and (5) sharable—one writer and multiple readers can simultaneously access the same file.

For more information or to obtain netCDF software, see http://www.unidata.ucar.edu/packages/netcdf/. (The above information on netCDF was taken from the Unidata Web site.)

ASCII

An American Standard Code for Information Interchange (ASCII) text file is one in which each byte represents one character according to the ASCII code. ASCII files are human readable and are sometimes called plain text files. Files that have been formatted with a word processor should be transmitted as binary files to preserve the formatting.

Binary

A binary file is computer readable but not human readable. Binary formats are used for executable programs and numeric data, whereas text formats are used for textual data. Many files contain a combination of binary and text formats. Such files are usually considered to be binary.

Earth System Science Data Centers

The Distributed Active Archive Centers (DAACs) are the data management and user services arm of NASA's EOSDIS. The data centers process, archive, document, and distribute data from NASA's past and current Earth-observing satellites and field measurement programs. Each center serves a specific Earth system science discipline.

This section presents the member centers and gives an overview of their data holdings. The User Services Office at each center offers data products, information, services, and tools to assist data users. This section provides contact information for the User Services Office at each data center.

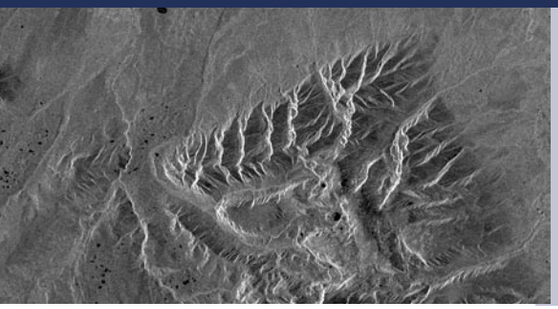
The following table lists the data centers and their Earth system science areas of expertise.

Earth System Science Data Centers

Data Center	Earth System Science Discipline
ASF DAAC Alaska Satellite Facility DAAC	Synthetic Aperture Radar (SAR), Sea Ice, Polar Processes, Geophysics
GES DAAC GSFC Earth Sciences DAAC	Atmospheric Composition, Atmospheric Dynamics, Global Precipitation, Ocean Biology, Ocean Dynamics, Solar Irradiance
GHRC Global Hydrology Resource Center	Hydrologic Cycle, Severe Weather Interactions, Lightning, Convection
LaRC DAAC Langley Research Center DAAC	Radiation Budget, Clouds, Aerosols, Tropospheric Chemistry
LP DAAC Land Processes DAAC	Land Processes
NSIDC DAAC National Snow and Ice Data Center DAAC	Snow and Ice, Cryosphere and Climate
ORNL DAAC Oak Ridge National Laboratory DAAC	Biogeochemical Dynamics, Ecological Data, Environmental Processes
PO.DAAC Physical Oceanography DAAC	Oceanic Processes, Air-Sea Interactions
SEDAC Socioeconomic Data and Applications Center	Population, Sustainability, Geospatial Data, Multilateral Environmental Agreements

For more information about the data centers, see http://nasadaacs.eos.nasa.gov.

ASF DAAC Alaska Satellite Facility DAAC



- SAR
- Sea Ice
- Polar Processes
- Geophysics

The ASF DAAC is located in the Geophysical Institute at the University of Alaska Fairbanks. The ASF DAAC is supported by NASA to acquire, process, archive, and distribute Synthetic Aperture Radar (SAR) data from polar-orbiting satellites to advance polar research and Earth science.

Available Data

ASF provides users with several types of SAR data from nearly raw (Level 0) to higher level derived products. ASF is actively archiving SAR data from the Canadian RADARSAT-1 and European Remote Sensing Satellite-2 (ERS-2). In addition, the ASF archive contains SAR data from the ERS-1 and Japanese Earth Resources Satellite-1 (JERS-1).
The majority of available data is considered restricted and available only to NASA-approved researchers. For information on becoming an approved researcher, see ASF's Web site at http://www.asf.alaska.edu/5_1.html. Unrestricted derived products are available for order. Information about unrestricted products is available from the Web at http://www.asf.alaska.edu/4_1.html. Products can be ordered through the Web via the EOS Data Gateway (EDG) or online order forms. FTP delivery is available for products ordered through the EDG.

Unrestricted Data

Antarctic Mosaic

Resolution: 125 m

Availability: October 1997

Coverage: Antarctica

The first, most complete and detailed views of the Antarctic continent were obtained by RADARSAT-1 during October 1997. The RADARSAT-1 SAR Mosaic of Antarctica was produced by the RADARSAT-1 Antarctic Mapping Project (RAMP). The mosaic is available by FTP at a resolution of 125 m and requires visualization software available from http://www.asf.alaska.edu/4_4_1_1.html.

Boreal Forest Mosaics

Resolution: 100 m to 2 km

Availability: 1997 and 1998

Coverage: North America boreal forest

JERS-1 SAR mosaics of boreal North America (Alaska and Canada) are now available on DVD. Winter and summer mosaics were assembled under the North American component of the Global Boreal Forest Mapping (GBFM) project. The DVD includes imagery extending from northern Alaska to the northeastern United States. Backscatter and texture products are provided as complete summer and winter mosaics at both 500-m and 2-km resolution. Backscatter data at 100-m resolution are also provided as tiles of about 50 JERS-1 scenes each.

Rain Forest Mosaics

Resolution: 100 m

Availability: Central America, 1996; South America, 1995 and 1996; Africa, 1996 and 1997; South-East Asia, 1997 and 1998

Coverage: Major rain forests

The goal of the Global Rain Forest Mapping (GRFM) project is to acquire contiguous SAR data sets of Earth's major rain forests using the JERS-1 satellite. ASF has available complete GRFM-produced mosaics of the Amazon, Central America, Africa, Pantanal region, Africa, and South-East Asia. The mosaics are available on CD-ROM.

Capturing a Dynamic Planet

Capturing a Dynamic Planet: Using Synthetic Aperture Radar to View the Earth, an outreach and informal education CD-ROM, provides an introduction to the use of Synthetic Aperature Radar (SAR) data for imaging the Earth's surface. Included on the CD are an image gallery with explanations on the possible applications of the images, and explanations of basic SAR and interferometric SAR concepts.

Geophysical Sea Ice Products

Availability: ERS-1 GPS, 1991 to 1993; RGPS, 1997 to 2000

Coverage: Arctic region

SAR imagery provides a detailed view of sea ice, which has a key role in the global climate system. From sequential data, sea ice features can be tracked over time. Ice motion data derived from ERS-1 SAR imagery and produced with the Geophysical Processor System (GPS) for the period from 1991 to 1993 is available for order via the EDG. In 1996, ASF began collecting and archiving RADARSAT-1 data of the entire Arctic Ocean every 3 to 6 days. The RADARSAT Geophysical Processor System (RGPS) produces a variety of ice motion data products, including new-ice thickness. All RGPS products are available from the Web at http://www.asf.alaska.edu/4_2.html.

Glacier Power

Glacier Power, a multimedia Earth sciences curriculum CD-ROM for use on Macintosh computers, was created primarily for middle school teachers. Glacier Power uses SAR data to lay a foundation in the subject of glacier dynamics through the use of imagery and cartoon characters.

Restricted Data

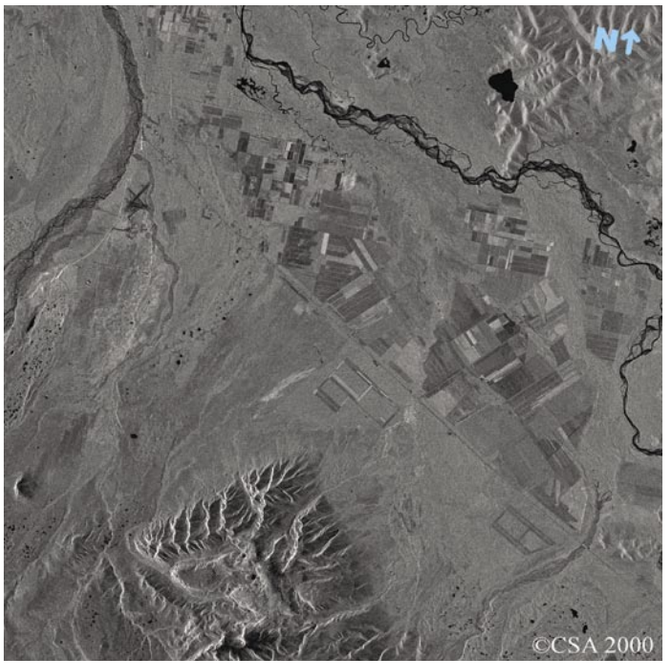
RADARSAT-1 C-Band SAR System

Resolution: 10 to 600 m

Availability: February 1996 to present

Coverage: Extensive within a circle of 3,000-km radius centered on ASF and McMurdo Station (Antarctica), more limited elsewhere in the world

The side-looking radar has a range of incidence angles from approximately 20 to 60 degrees. Swath widths range



This SAR image of Delta Junction, Alaska, was acquired August 21, 2000, by the RADARSAT-1 satellite using the Fine-1 beam mode. The rectangular features in the central portion of the image are agricultural fields. To the north and east of the agricultural fields is the Tanana River, while the prominent feature at the bottom of the image is Granite Mountain. The image area is approximately 50 by 50 km.

from approximately 50 to 500 km. Significant coverage outside the ASF and McMurdo Station masks is also available. New acquisitions are available both within and outside the ASF and McMurdo Station masks. RADARSAT-1 data are the property of the Canadian Space Agency (CSA).

RADARSAT-1 SAR Mosaic of Antarctica

This 25-m resolution product of the RAMP is available as a 15-DVD set.

ERS-1 and ERS-2 C-Band SAR Systems

Resolution: 30 to 240 m

Availability: ERS-1, August 1991 to June 1996; ERS-2, October 1995 to present

Coverage: Within a circle of 3,000-km radius centered on ASF and McMurdo Station

The side-looking radar has an incidence angle of 23 degrees and a 100-km swath width. ERS-2 is a current mission and new acquisitions are available within the stated coverage. ERS-1 and ERS-2 data are the property of the European Space Agency (ESA).

JERS-1 L-Band SAR System

Resolution: 30 to 240 m

Availability: May 1992 to October 1998

Coverage: Extensive within a circle of 2,600-km radius centered on ASF and over Central and South America

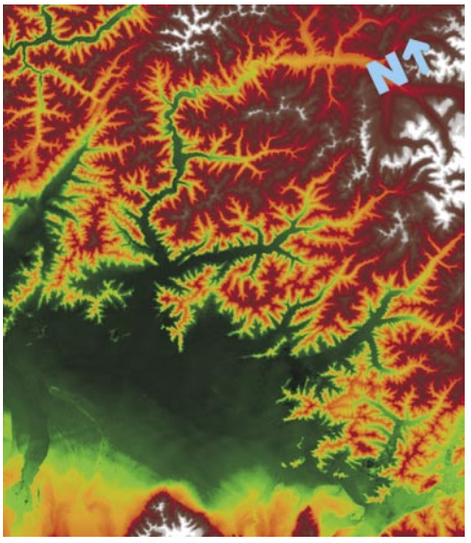
The side-looking radar has an incidence angle of 35 degrees and a 75-km swath width. Limited coverage outside the ASF mask, including extensive rain forest and boreal forest data, is also available. JERS-1 data are the property of the Japan Aerospace Exploration Agency (JAXA).

Data Tools

The ASF software tools are designed to make it easier for users to process ASF data products and translate them into a variety of other formats. The tools support all ASF satellite SAR data sources (ERS 1/2, JERS-1, and RADARSAT-1).

The tools can ingest most Level 1 ASF products, and produce geocoded (or ungeocoded) GeoTIFF, TIFF, JPEG, or portable pixel map images. A graphical user interface exists which guides the user through the process of ingesting, geocoding, and exporting datasets. The SAR interferometric (InSAR) tools that deal with Level 0 data as input are currently under revision. An old version of the InSAR tool set is still available, but using it effectively may require assistance from ASF personnel. Distribution of Level 0 processing binaries is restricted by U.S. export laws. Source code is available by cooperative agreement only.

The ASF software tools can be downloaded via ftp from http://www.asf.alaska.edu/software/index.html. The same page also provides access to tutorials on the ASF software tools and the ASF Forum, a place for the user community and ASF staff to interact with each other online about technical topics related to ASF data, ASF software tools, SAR applications and other issues.



This 30-m digital elevation model of the Delta Junction area was created from ERS-1 and ERS-2 tandem mission data. The colors reflect varying elevations, with green representing the lowest elevations and white the highest. The coverage area is approximately 130 by 100 km.
Note: Granite Mountain shown in the SAR image appears in the bottom left edge of this image. The scale, coverage, and orientation of the two images differ.

Data Access

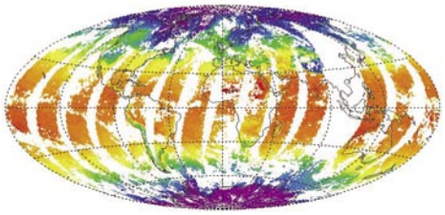
Online access to ASF DAAC data is available through the EDG data search-and-order system (see page 5-1).

For assistance or additional information, contact

ASF DAAC User Services
Alaska Satellite Facility
University of Alaska Fairbanks

Phone: +1 907–474–6166
Fax: +1 907–474–2665
E-mail: asf@eos.nasa.gov or
uso@asf.alaska.edu
URL: http://www.asf.alaska.edu

GES DAAC Goddard Space Flight Center Earth Sciences (GES) DAAC



- Atmospheric Composition
- Atmospheric Dynamics
- Global Precipitation
- Ocean Biology
- Ocean Dynamics
- Solar Irradiance

The NASA GES DAAC provides data and services that enable users to fully realize the scientific, educational, and application potential of global climate data. GES DAAC data and services are responsive to user needs, accommodating to their unanticipated demands, and innovative in availing them of the latest appropriate technology.

Available Data

AIRS/AMSU-A/HSB on Aqua

Resolution: AIRS IR at 13.5 km at nadir, 41 by 21.4 km at the scan extremes, and 1 km vertical; AIRS VIS/NIR at 2.3 km at nadir; AMSU-A at 40.5 km at nadir; HSB at 13.5 km at nadir

Availability: AIRS and AMSU-A, September 1, 2002, to present; HSB, September 1, 2002, to January 31, 2003

Coverage: Global, twice daily swath (daytime and nighttime)

The Atmospheric Infrared Sounder (AIRS) is a high-spectral-resolution spectrometer with 2,378 bands in the thermal infrared (IR) and 4 bands in the visible and near infrared (VIS/NIR). AIRS and its two sounder partners—the Advanced Microwave Sounding Unit A (AMSU-A) and the Humidity Sounder for Brazil (HSB)—form the AIRS Sounding System. Since reaching polar orbit in May 2002, this system has been providing accurate measurements of air temperature, humidity, clouds, and surface temperature.
GES DAAC distributes Level 1B and Level 2 radiometric, geolocation, and higher level products <http://disc.gsfc.nasa.gov/AIRS/>.

Climatology Interdisciplinary Data Collection (CIDC)

Resolution: 1 by 1 deg (some 2 by 2 deg and 5 by 5 deg); monthly means

Availability: 10- to 20-year periods; some long-term climatologies from 1850, covering more than 150 years

Coverage: Global

CIDC data consist of more than 70 global climate parameters related to the atmosphere, land, ocean, biosphere, cryosphere, and Sun <http://disc.gsfc.nasa.gov/interdisc/>.

Greenhouse Effect Detection Experiment (GEDEX)

Availability: 10-year period spanning the 1980s for many data sets

Coverage: Local, regional, or global, depending on the data set

The GEDEX collection contains more than 60 data sets with parameters relevant to greenhouse gas research, including surface and upper air temperatures, solar irradiances, radiation budget, clouds, and greenhouse gases <http://disc.gsfc.nasa.gov/interdisc/>.

MLS/Aura

Resolution: 300 km along track, 3 km vertical

Availability: August 2004 to present

Coverage: Global

MLS measures microwave emissions of the Earth limb. The instrument is an improved version of the one flown on UARS. MLS data products include vertical profiles of ozone, water vapor, BrO, ClO, CO, OH, HO2, HCN, HNO3, N2O, HCl, HOCl, SO2, cirrus ice, geopotential height, and temperature <http://disc.gsfc.nasa.gov/Aura/>.

MODIS on Terra and Aqua

Resolution: 250 m, 500 m, and 1 km

Availability: Terra, February 2000 to present; Aqua, August 2002 to present

Coverage: Global

The Moderate Resolution Imaging Spectroradiometer (MODIS) acquires data in 36 discrete spectral bands between 0.4 and 14.5 µm. MODIS data almost completely cover Earth in one day. MODIS's strength lies in its combination of high radiometric resolution and appropriate dynamic range, global coverage, and accurate calibration of visible and thermal IR bands for retrieving atmospheric, land, and sea surface properties. MODIS data are useful for long-term climate and global change studies, as well as for short-term monitoring of natural disasters. GES DAAC distributes MODIS Level 1 radiometric, geolocation, and higher level ocean and atmosphere products <http://disc.gsfc.nasa.gov/MODIS/>.

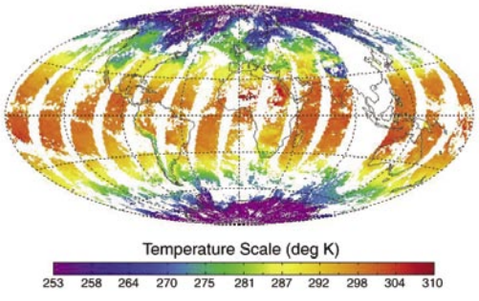
MODIS Airborne Simulator (MAS)

Resolution: 50 m at 20-km altitude

Availability: 1993 to present

Coverage: Aircraft data

MAS data are derived from a 50-channel spectrometer on a NASA ER-2 high-altitude aircraft. The data help define, develop, and test algorithms for MODIS data <http://disc.gsfc.nasa.gov/fieldexp/MAS/>.



This image, acquired on April 1, 2003, displays AIRS standard retrieval of surface skin temperature. Depending on the winds and humidity at the air-sea interface, and cloud cover, the skin temperature can deviate substantially from the bulk temperature of the water. The sea surface temperatures are of ultimate importance to montor and predict climate variability on the planet. This goal mandates unprecedented accuracy of the retrieval. The surface temperatures are as well irreplaceable for the shorter range synoptic forecasts.

Nimbus-7 CZCS

Resolution: Radiance measurements at 1 km and 4 km; pigment concentrations and water-leaving radiances at 4 km and 20 km

Availability: November 1978 to June 1986

Coverage: Global

The Coastal Zone Color Scanner (CZCS) was a multispectral line scanner mainly devoted to measurements of ocean color. It had six spectral bands. CZCS Levels 1, 2, and 3 data products are available.

OMI/Aura

Resolution: 13 by 24 km at nadir

Availability: September 2004 to present

Coverage: Global

OMI is a hyperspectral instrument which measures solar backscattered ultraviolet and visible radiation. OMI continues the long-term record made by TOMS. OMI data products are generated for total column amounts of ozone, NO2, SO2, BrO, and OClO, aerosol and cloud properties, UV-B flux, and ozone profiles <http://disc.gsfc.nasa.gov/Aura/>.

Sea-viewing Wide Field-of-view Sensor (SeaWiFS)

Resolution: Raw radiance data at 1 km; processed radiance and geophysical products at 4 km and 9 km

Availability: September 1997 to present (1 km only through December 2004)

Coverage: Local, regional, and global SeaWiFS provides raw radiance data and processed orbital swath and global data products that include normalized water-leaving radiances, chlorophyll concentration, and atmospheric optical parameters.

Solar Radiation and Climate Experiment (SORCE)

Resolution: Full solar disk data at different spectral resolutions

Availability: January 2003 to present

Coverage: Full solar disk

SORCE carries four instruments: the Total Irradiance Monitor (TIM), the Solar Stellar Irradiance Comparison Experiment (SOLSTICE), the Spectral Irradiance Monitor (SIM), and the Extreme Ultraviolet Photometer System (XPS). SORCE data contain measurements of the incoming x-ray, UV, visible, near-infrared, and total solar radiation <http://disc.gsfc.nasa.gov/SORCE/>.

TIROS Operational Vertical Sounder (TOVS) Pathfinder

Resolution: 1 deg

Availability: 1978 to 1994

Coverage: Global

Data contain profiles of temperature, moisture, precipitation, cloudiness, and outgoing longwave radiation.

Total Ozone Mapping Spectrometer (TOMS)

Resolution: 1 by 1.25 deg

Availability: Nimbus-7, November 1978 to May 1993; Meteor-3, August 1991 to December 1994; ADEOS, September 1996 to June 1997; EP, July 1996 to present

Coverage: Global

Data contain global column ozone amounts and UV reflectivity, and are available from the Nimbus-7 and Meteor-3 satellites and the Advanced Earth Observing System (ADEOS) and Earth Probe (EP) missions <http://daac.gsfc.nasa.gov/data/dataset/TOMS/>.

TOGA-COARE

Resolution: Varies with data set

Availability: November 1992 to February 1993

Coverage: Tropical Pacific

Tropical Ocean Global Atmospheres-Coupled Ocean Atmosphere Response Experiment (TOGA-COARE) data contain field observations of radiation, cloud, and precipitation parameters collected from surface-, aircraft-, and satellite-based instruments <http://disc.gsfc.nasa.gov/fieldexp/TOGA/>.

Tropical Rainfall Measuring Mission (TRMM)

Resolution: VIRS at 2.2 km; TMI at 5.0 to 45 km; PR at 4.0 km; Level 3 precipitation at 0.25 by 0.25 deg, 0.5 by 0.5 deg, 1 by 1 deg and 5 by 5 deg

Availability: December 1997 to present

Coverage: 40° N to 40° S global

TRMM products contain Visible/Infrared Scanner (VIRS), TRMM Microwave Imager (TMI), and Precipitation Radar (PR) observations of tropical and subtropical rain systems and spatially and temporally resampled precipitation data <http://lake.nascom.nasa.gov/data/dataset/TRMM/>.

Upper Atmosphere Research Satellite (UARS)

Resolution: Most atmospheric products at a 4-deg interval along track; solar spectral data at 1 nm

Availability: September 1991 to present

Coverage: Near global (80° N to 80° S)

The GES DAAC archives upper atmospheric data from nine UARS instruments (CLAES, HALOE, HRDI, ISAMS, MLS, PEM, SOLSTICE, SUSIM, and WINDII) and UARS correlative data. Data contain profiles of upper atmospheric chemical constituents, winds, solar irradiance, and energetic particle input. Products are available as time- and latitude-ordered data sets <http://daac.gsfc.nasa.gov/data/dataset/UARS/>.

Data Access

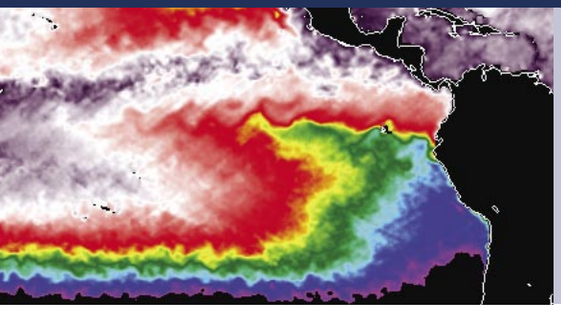
Data can be ordered through the online search-and-order system <http://disc.gsfc.nasa.gov/get_data.shtml>. Access to GES DAAC data is also available through the EDG (see page 5-1).

For assistance or additional information, contact

GES DAAC User Services
Goddard Space Flight Center

Phone: +1 301–614–5224
U.S. Toll Free 1–877–422–1222
Fax: +1 301–614–5268
E-mail: gsfc@eos.nasa.gov or
help@daac.gsfc.nasa.gov
URL: http://disc.gsfc.nasa.gov/

GHRC Global Hydrology and Resource Center



- Hydrologic Cycle
- Severe Weather Interactions
- Lightning
- Convection

The GHRC provides both historical and current Earth science data, information, and products from satellite, airborne, and surface-based instruments. The GHRC acquires basic data streams and produces derived products from many instruments spread across a variety of instrument platforms.

Available Data

Lightning Data Products

Space-based lightning observations are obtained from the Lightning Imaging Sensor (LIS), the Optical Transient Detector (OTD), and surface validation networks in the continental United States and Brazil.

LIS and OTD

Resolution: LIS, 4 km; OTD, 70 km

Availability: LIS, 1998 to present; OTD, 1995 to 2000

Coverage: LIS, 35° N to 35° S; OTD, 70° N to 70° S

The world's first space-based lightning sensors are capable of detecting and locating lightning events during day-and-night conditions with high detection efficiency. The LIS sensor contains a staring imager which is optimized to locate and detect lightning with storm-scale resolution of 3-6 km (3 at nadir, 6 at limb) over a large region (550-550 km) of Earth's surface. The field of view (FOV) is sufficient to observe a point on Earth or a cloud for 80 seconds, adequate to estimate the flashing rate of many storms. The instrument records the time of occurrence of a lightning event, measures the radiant energy, and estimates the location.

Passive Microwave Data Products

Global hydrological parameters such as sea surface temperature, atmospheric water vapor, wind direction, and atmospheric temperature are derived from several passive microwave instruments on board the Tropical Rainfall Measuring Mission (TRMM), NOAA-15, NOAA-16, NOAA-17, and Special Sensor Microwave/Imager (SSM/I) Defense Meteorological Satellite Program (DMSP) F-8 through F-15 satellite series.

The GHRC hosts data for Distributed Information Services for Climate and Ocean products and Visualizations for Earth Research (DISCOVER), a NASA REASoN (Research, Education, Applications Solutions Network) project. DISCOVER is the successor to the Passive Microwave Earth Science Information Partner (PM-ESIP), providing measurement of maximum tropical cyclone wind speeds, global tropospheric and atmospheric temperatures, and observations of tropical rainfall, sea surface temperature, and wind speed.

Global Tropospheric and Stratospheric Deep Layer Temperature Data

Resolution: 22 to 90 km

Availability: 1979 to present

Coverage: Global

Data are derived from the Advanced Microwave Sounding Unit (AMSU) and the Microwave Sounding Unit (MSU). This long-term measurement series contains three products, each giving temperature data averaged over a particular depth range of the atmospheric (lower stratosphere, middle troposphere, and lower troposphere).

SSM/I

Resolution: 12.5 km @ 85 GHz; 25 km all others

Availability:
F13: 1995-05-03 to present
F14: 1997-05-10 to present
F15: 2000-02-23 to present

Coverage: Global

Brightness temperatures (7 channels), water vapor, wind speed, and ocean wind speed data products are available.

TRMM Microwave Imager (TMI)

Resolution: About 25 km

Availability: 1997 to present

Coverage: 35° N to 35° S

Data products include water vapor, cloud water, ocean wind speed, and sea surface temperatures.

Field Experiment Data Sets

Airborne Passive Microwave Radiometer (AMPR)

Resolution: 0.6 to 2.8 km at nadir

Availability: 1990 to 2001 for numerous field campaigns

Coverage: Field-campaign dependent

AMPR instrument data sets at 85, 37, 19, and 10 GHz were acquired on board the NASA ER-2 during the CAMEX-1, CAMEX-2, CAMEX-3, CAMEX-4, Texas and Florida Under-flights (TEFLUN), First International Satellite Cloud Climatology Project (ISCCP) Regional Experiment-Arctic Cloud Experiment (FIRE-ACE), and Convection and Precipitation/Electrification Experiment (CaPE) field experiments.

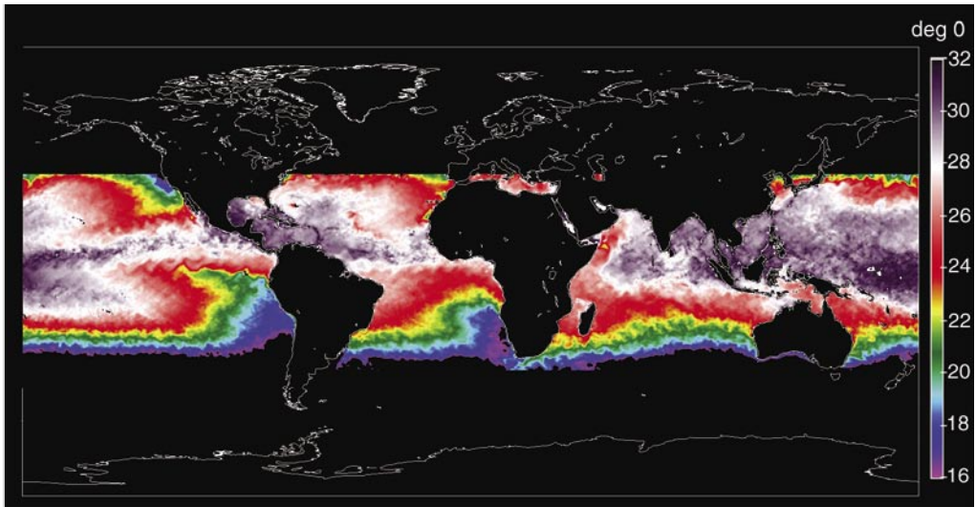
Altus Cloud Electrification Study (ACES)

Resolution: Data set dependent

Availability: August 2002

Coverage: Southwestern Florida

Based out of the Key West Naval Air Facility, conducted in August 2002, ACES contributed important electrical and optical measurements not available from other sources. Making use of the Altus II uninhabited aerial vehicle (UAV), scientists collected several types of electrical data by flying over the tops of thunderstorms.



This TRMM Microwave Imager (TMI) image shows Sea Surface Temperature during a 3-day period, September 20-22, 2004, during which Hurricane Jeanne aimlessly churned in the Eastern Atlantic—before heading west to punish the state of Florida with its fourth direct hit of the 2004 hurricane season.

Convection and Moisture Experiment (CAMEX)

The CAMEX archive provides data from the CAMEX-3 and CAMEX-4 field experiments and earlier campaigns. These experiments produced high-resolution spatial and temporal information of hurricane structure, dynamics, and motion.

CAMEX-3

Resolution: Data set dependent

Availability: August to September 1998

Coverage: Western Atlantic, Caribbean, and Gulf of Mexico

CAMEX-3 is the third field campaign in the CAMEX series. CAMEX-3 holdings include hurricane research data sets derived from a variety of passive microwave, radar, infrared, visible, lidar, interferometer, electric field, and lightning instruments on board the NASA ER-2 and DC-8 aircraft, as well as surface station instruments on Andros Island, Bahamas.

CAMEX-4

Resolution: Data set dependent

Availability: August to September 2001

Coverage: Western Atlantic, Caribbean, and Gulf of Mexico

The fourth field campaign in the CAMEX series was based out of Jacksonville Naval Air Station, Florida, from August to September 2001. CAMEX-4 focused on the study of tropical cyclone (hurricane) development, tracking, intensification, and landfalling impacts using NASA-funded aircraft and surface remote sensing instrumentation. Through use of the NASA DC-8 and ER-2 aircraft along with the NOAA P-3 and (for the first time) Aerosonde (a small UAV), data were collected in the vicinity of several tropical storms and hurricanes. The experiments were designed to provide data that will allow scientists to better understand the dynamic nature of these dangerous storms.

Future Data Sets

The GHRC will be supporting the Tropical Cloud Systems and Processes (TCSP) research experiment in the summer of 2005. The GHRC will be providing real-time and static web support, data ingest, and archive for the project PI's. The GHRC will also be the data distribution and user services site for many of the data sets that will be created from this experiment. The TCSP is a follow-on to the previous CAMEX experiments. This experiment will be studying the dynamics and thermodynamics of precipitating cloud systems, including tropical cyclones, over the tropical eastern Pacific. Targeted datasets will be collected using the NASA ER-2 research aircraft, in synergy with remote sensing observations provided by NASA and other agencies. These observations will be used to answer key questions pertaining to the origins and lifecycle of weather disturbances in the tropics. Analyses of datasets will address a wide variety of atmospheric space and time scales, ranging from the convective through the synoptic. Investigations will also be conducted to improve upon numerical modeling studies of tropical cyclogenesis, including wave-to-depression transition in the western Caribbean, Gulf of Mexico and Eastern Pacific Oceans. Aircraft from the NOAA Hurricane Research Division (HRD) will fly coordinated missions with the NASA research aircraft to investigate developing tropical disturbances.

GHRC Data Pool

As part of the NASA-funded DISCOVER project, the GHRC and UAH have developed a Data Pool environment to support the automated online data ordering of Earth science data sets, in particular passive microwave and other related products <http://datapool.nsstc.nasa.gov>.

Data Access

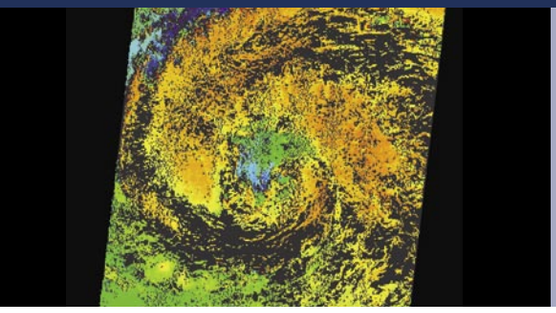
Most data are publicly available, although some restrictions apply for the distribution of commercially obtained data. Access to data, data search and order, and information about GHRC's data sets can be found at the Web site given below. Online data access is also available through the EDG (see page 5-1).

For assistance or additional information, contact

GHRC User Services
Global Hydrology and Climate Center

Phone: +1 256–961–7932
Fax: +1 256–961–7723
E-mail: ghrc@eos.nasa.gov or
userservices@microwave.nsstc.nasa.gov
URL: http://ghrc.msfc.nasa.gov

LaRC DAAC Langley Research Center DAAC



- Radiation Budget
- Clouds
- Aerosols
- Tropospheric Chemistry

The NASA LaRC DAAC supports more than 35 projects and has more than 800 archived data sets. These data sets were obtained from satellite measurements, field experiments, and modeled data products. A complete list of data sets is available on the Web at http://eosweb.larc.nasa.gov.

Available Data

Data sets are listed under their main discipline. However, most of the data sets contain data for multiple disciplines.

Radiation Budget

Radiation budget data sets contain information related to the variability of total solar irradiance, top of atmosphere and surface radiation properties, effects of clouds on the energy budget, as well as data useful for solar energy technologies.

Availability: Varies by data set, from 1978 to present

Coverage: Global for most data

- Active Cavity Radiometer Irradiance Monitor (ACRIM) II and III
- Airborne Multi-angle Imaging SpectroRadiometer (AirMISR)
- ARM (Atmospheric Radiation Measurements) Enhanced Short-wave Experiment (ARESE)
- Atlantic-THORpex Observing System Test (ATOST)
- Convection And Moisture EXperiment (CAMEX) 4
- Clouds and the Earth's Radiant Energy System (CERES)
- Chesapeake Lighthouse and Aircraft Measurements for Satellites (CLAMS)
- Earth Radiation Budget Experiment (ERBE)
- Multi-angle Imaging SpectroRadiometer (MISR)
- Nimbus-7 Earth Radiation Budget (ERB)
- Sulfates/Smoke, Clouds, and Radiation (SCAR) A and B
- Surface Radiation Budget (SRB)
- Surface meteorology and Solar Energy (SSE)
- THe Observing-system Research and predictability experiment (THORpex)

Clouds

Cloud data sets contain information on the radiative properties of clouds; cirrus, marine stratus, and arctic cloud field studies; and subsonic aircraft effects on contrails and other cloud systems.

Availability: Varies by data set, from 1980 to present

Coverage: Ranges in spatial extent from field campaign to global coverage

- International Satellite Cloud Climatology Project (ISCCP)
- First ISCCP Regional Experiment (FIRE)
- SUbsonic aircraft: Contrail Cloud Effects Special Study (SUCCESS)

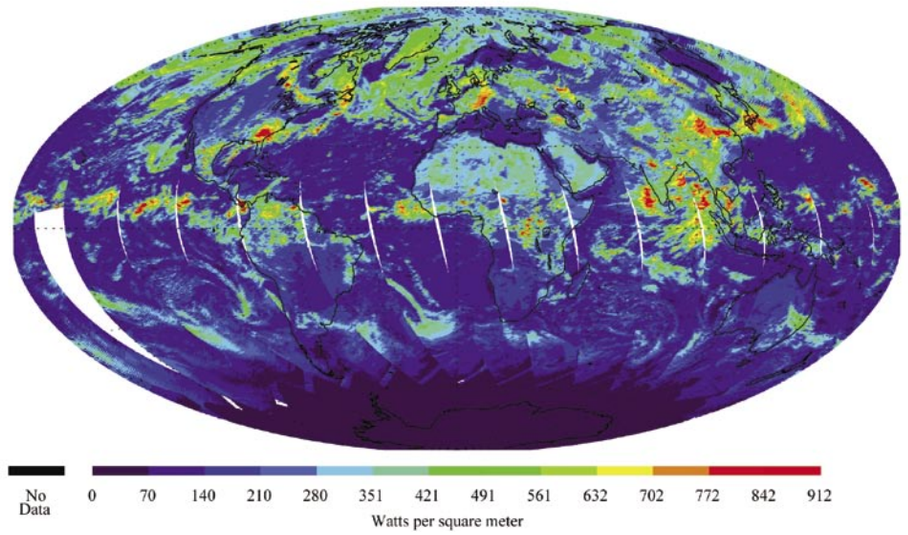
Aerosols

Aerosol data sets contain satellite- and lidar-derived information on the spatial and vertical distribution of stratospheric and tropospheric aerosols, as well as direct radiative impacts and chemical, physical, and optical properties of aerosols.

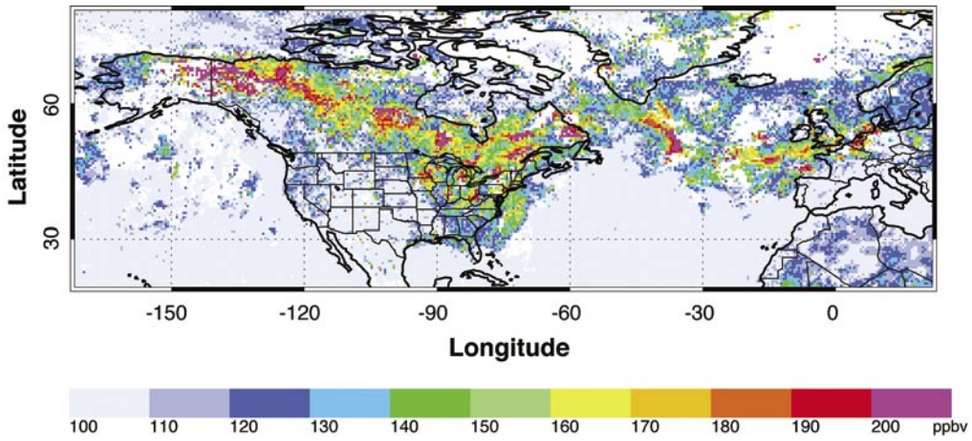
Availability: Varies by data set, from 1978 to present

Coverage: Ranges in spatial extent from field campaign to global coverage

- 48-inch Light Detection and Ranging (48" LIDAR) Aerosol Research Branch (ARB)
- Lidar Atmospheric Sensing Experiment (LASE)
- Lidar In Space Technology Experiment (LITE)
- Polar Ozone and Aerosol Measurement (POAM) II
- Stratospheric Aerosol and Gas Experiment (SAGE) I, II, and III
- Stratospheric Aerosol Measurement (SAM) II
- Tropospheric Aerosol Radiative Forcing Observational eXperiment (TARFOX)



This image shows total sky Top-of-Atmosphere (TOA) shortwave flux from the CERES Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF) Aqua-FM3 Edition1B data for July 1, 2003.



MOPITT 700 hPa CO mixing ratio for the period July 15-23, 2004, during the INTEX-NA field campaign. The intense wildfires in Alaska produced plumes of pollution that can be traced across North America and the Atlantic Ocean. Image provided by MOPITT Team.

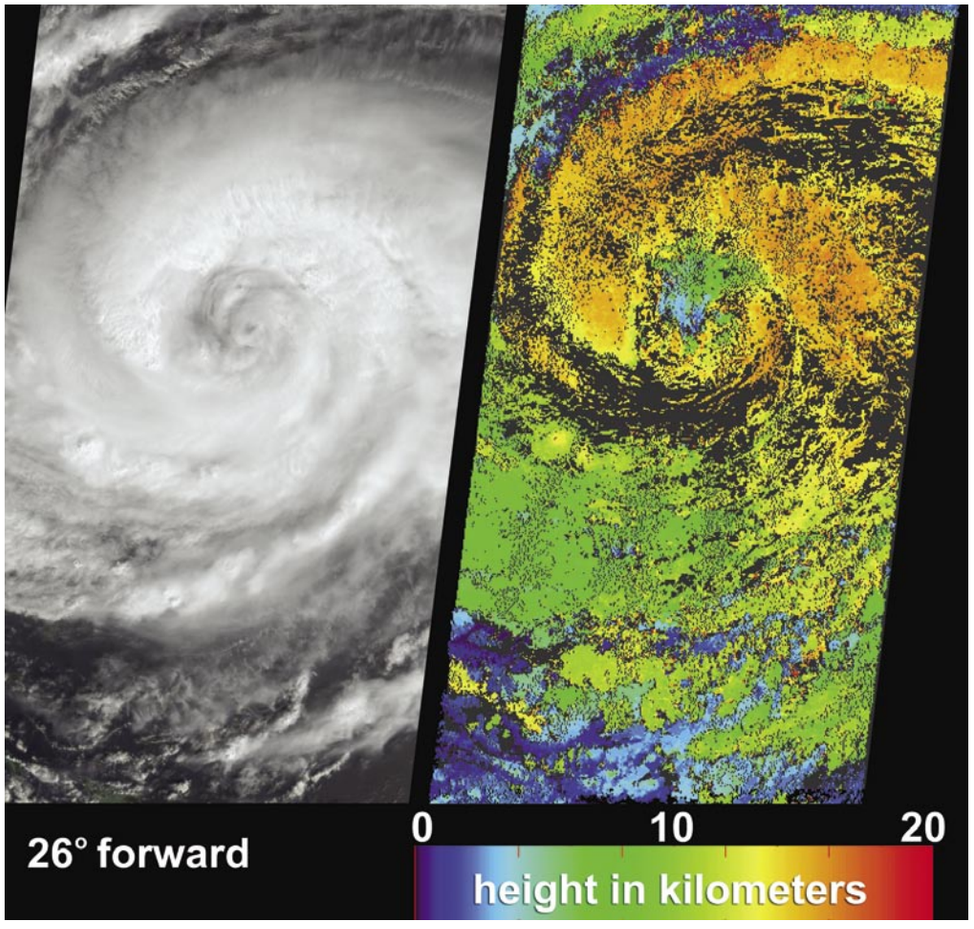
Tropospheric Chemistry

Tropospheric chemistry includes geographic and temporal distribution of biomass burned, concentrations of key chemical species, and distribution and behavior of tropospheric carbon monoxide, ozone, and water vapor.

Availability: Varies by data set, from 1983 to present

Coverage: Ranges in spatial extent from field campaign to global coverage

- Biomass Burning
- Global Tropospheric Experiment (GTE)
- Measurement of Air Pollution from Satellites (MAPS)
- Measurements of Pollution In The Troposphere (MOPITT)
- NASA Water Vapor Project (NVAP)
- North American Research Strategy for Tropospheric Ozone (NARSTO)
- Special Sensor Microwave/Imager (SSM/I)
- Tropospheric Emission Spectrometer (TES)



These visualizations of Hurricane Jeanne on September 24, 2004, were captured by the MISR instrument onboard the Terra satellite (Path 10, Orbit 25372). The panels include a natural color view from MISR's 26-degree forward-viewing camera (left) and a two dimensional map of cloud-top heights (right). Image provided by NASA/GSFC/ LaRC/JPL MISR Team.

Future Data Sets

- Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO)
- Fast Longwave and SHortwave radiation Fluxes (FLASHFlux)
- Orbiting Carbon Observatory (OCO)

Data Access

There are multiple methods of obtaining data and information from the NASA Langley Atmospheric Science Data Center (ASDC) including ASDC ordering tools, Data Pool, Web download of renewable energy data (SSE), pre-packaged CDs, and EDG (see page 5-1). Details are available from the Web site below.

For assistance or additional information, contact

User and Data Services
NASA Langley Research Center

Phone: +1 757–864–8656
Fax: +1 757–864–8807
E-mail: larc@eos.nasa.gov
URL: http://eosweb.larc.nasa.gov

LP DAAC Land Processes DAAC – USGS National Center for EROS

- Land Processes

The LP DAAC promotes interdisciplinary study and understanding of Earth's integrated systems by providing data for the investigation, characterization, and monitoring of biologic, geologic, hydrologic, ecologic, and related conditions and processes. The LP DAAC ingests, processes, distributes, and archives data for land-related EOS sensors.

Available Data

Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Products

Resolution: VNIR at 15 m; SWIR at 30 m; TIR at 90 m

Availability: March 2000 to present

Coverage: Global (on demand)

Of the instruments on board Terra, ASTER offers the highest resolution image data in visible and near-infrared (VNIR), shortwave infrared (SWIR), and thermal infrared (TIR) wavelengths. Routinely acquired data and data products generated include Level 1A reconstructed unprocessed instrument data and Level 1B registered radiance at the sensor data. Higher level products, which can be requested on demand, include brightness temperature, surface reflectance, decorrelation stretch, surface radiance, surface emissivity, surface kinetic temperature, polar cloud classification, and digital elevation models. The ASTER DEM coverage map is available from http://LPDAAC.usgs.gov/aster/dem_map.asp.

MODIS Products from Terra and Aqua

Resolution: 250 m, 500 m, and 1 km

Availability: Terra, February 2000 to present; Aqua, August 2002 to present; combined Terra and Aqua products, July 2002 to present

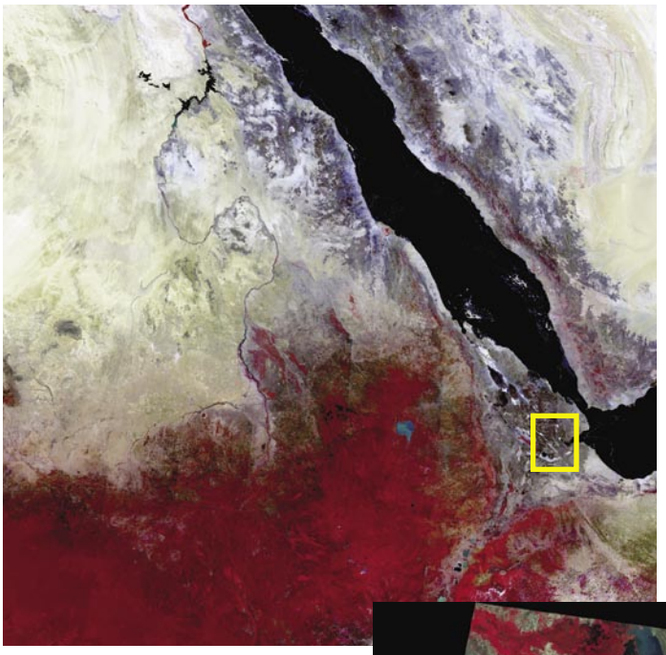
Coverage: Global

The Moderate Resolution Imaging Spectroradiometer (MODIS) provides an integrated tool for observing a variety of terrestrial, oceanic, and atmospheric features of Earth. Data sets are Level 2 and higher and include surface reflectance, land surface temperature, vegetation indices, fire anomalies, leaf area index, bidirectional reflectance distribution function and albedo, land cover change, vegetation cover conversion, and net primary production.

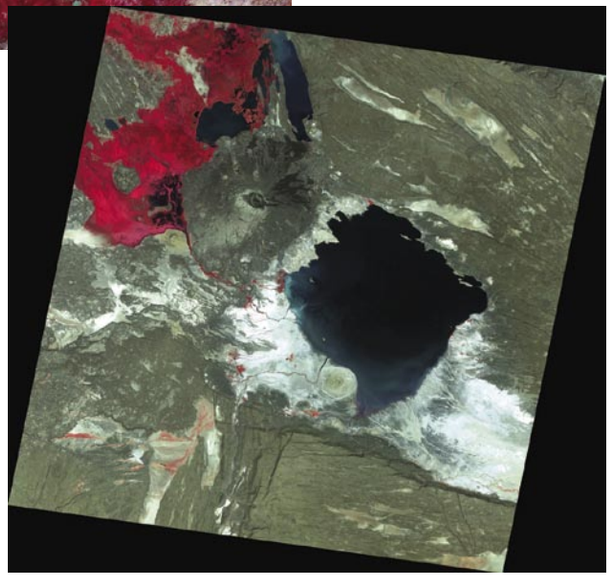
These higher data products have been designed to remove the burden of certain common types of data processing from the user community and meet the more general needs of global-to-regional monitoring, modeling, and assessment.

Future Data

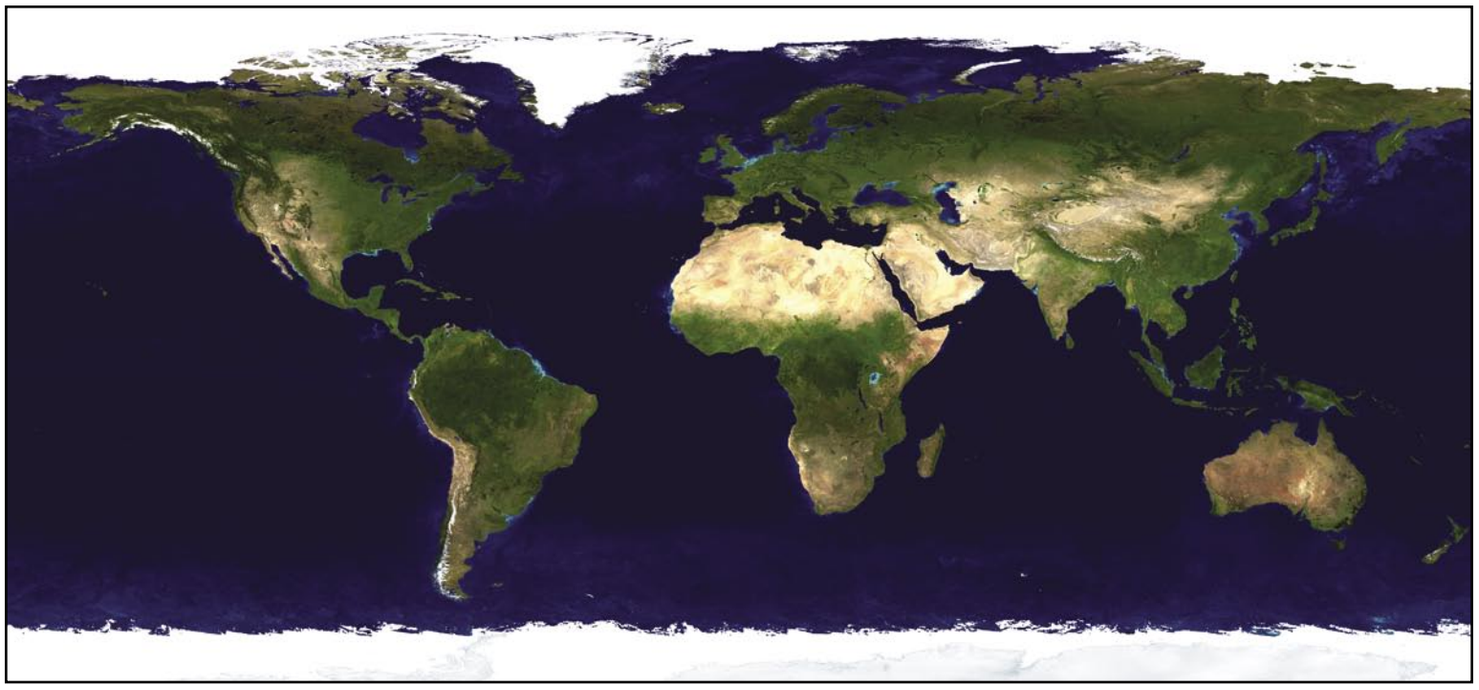
The LP DAAC will archive and distribute a new collection (V005) of land products from the MODIS sensors. This will include the reprocessing of the Terra and Aqua V004 products from the beginning of missions (February 2000 and July 2002 respectively). The V005 will be released the latter part of 2005.



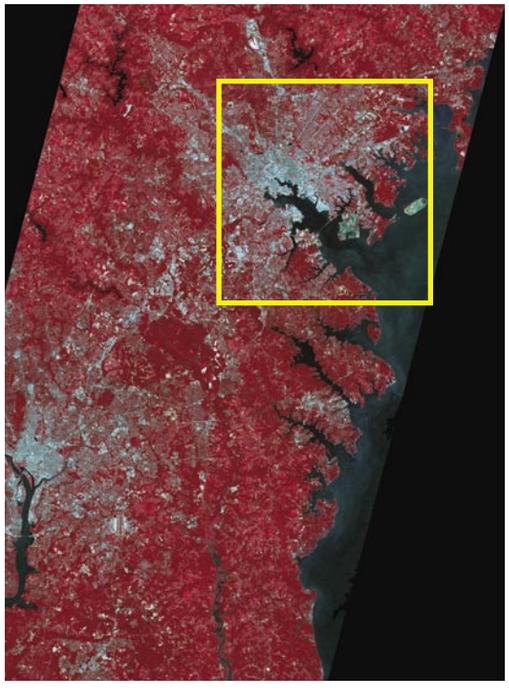
This MODIS surface reflectance mosaic (left) is an eight day composite collected November 8 - 15, 2004 and shows the eastern portion of Africa. The false-color band combination (2, 1, and 3 as RGB) shows healthy vegetation as red and includes the countries of Chad, Sudan, and Ethiopia. The desert regions of Saudi Arabia and the Sahara Desert are represented in tan. This MODIS image is in 500 meter resolution.



The ASTER image (right) shows Lake Abhé and Dama Ali Volcano. The lake, which is surrounded by quicksand, spans across the Djiboutian and Ethiopian borders. In the past, this region had heavy volcanic activity. The last eruption of Dama Ali Volcano was around 1631. This ASTER false color image was created using band combination of 3N, 2, and 1 (red, green, and blue respectively). This ASTER VNIR image is in 15 meter resolution.



This "blue marble" composite is the most detailed true-color image of the entire Earth to date. Much of the information came from one remote sensor—MODIS. This value-added surface reflectance image combines satellite-based observations of land surface, oceans, sea ice, and clouds into a seamless mosaic of every square kilometer of the planet. Land and coastal ocean portions were based on surface observations collected from June through September 2001, composited every 8 days to compensate for clouds. Ocean data comprise shallow water true-color and global ocean color data. Topographic shading was based on the GTOPO30 data set. MODIS and AVHRR observations of Antarctica were combined. (Credits: NASA GSFC, MODIS Land Group, MODIS Atmosphere Group, MODIS Ocean Group, USGS National Center for EROS, USGS Terrestrial Remote Sensing Flagstaff Field Center, DMSP).



The Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) is an advanced multispectral imager that was launched on board NASA's Terra spacecraft in December, 1999. Terra is the first of a series of multi-instrument spacecraft forming NASA's Earth Observing System (EOS).

The ASTER images are false color using bands 3N, 2, and 1 in red, green, and blue. Red indicates healthy vegetation. This ASTER VNIR image is in 15 meter resolution.

The image on the left is a false color mosaic created from three ASTER images. It captures the cities of Baltimore (in yellow box) and Washington D.C, including the Chesapeake Bay Area.

The above image is a subset of Baltimore, Maryland. The small island on the right is Hart-Miller Pleasant Island.

Data Access

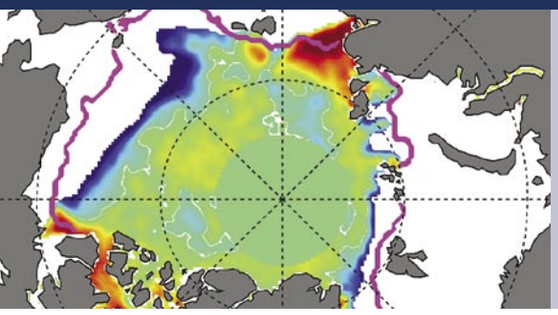
Access to data, data search, order, and browse, and order information including information on Land Processes DAAC is available at http://LPDAAC.usgs.gov. An online search-and-order service is also available through the EDG (see page 5-1). Before ordering, users are encouraged to use the tutorial at http://LPDAAC.usgs.gov/tutorial/. Data are available by FTP or on a variety of media, including CD-ROM and DVD.

For assistance or additional information, contact

LP DAAC User Services
U.S. Geological Survey
National Center for Earth Resources Observation and Science (EROS)

Phone: +1 605–594–6116
U.S. Toll Free: 1–866–573–3222
Fax: +1 605–594–6963
E-mail: edc@eos.nasa.gov
URL: http://LPDAAC.usgs.gov

NSIDC DAAC National Snow and Ice Data Center DAAC



- Snow and Ice
- Cryosphere and Climate

The NSIDC DAAC provides data and information for snow and ice processes, particularly interactions among snow, ice, atmosphere, and ocean, in support of research in global change detection and model validation. NSIDC also provides general data and information services to the cryospheric and polar processes research community.

Available Data

Terra and Aqua Products

Snow and Sea Ice Extent from MODIS on Terra and Aqua

Resolution: Snow cover at 500 m and 0.5 deg; sea ice extent at 1 km and 4 km

Availability: Terra, February 2000 to present; Aqua, July 2002 to present

Coverage: Global

NSIDC's holdings include several Moderate Resolution Imaging Spectroradiometer (MODIS) snow and sea ice extent products. These products consist of Level 2 swath data and Level 3 gridded composites.

Advanced Microwave Scanning Radiometer-EOS (AMSR-E) on Aqua

Resolution: 5 to 56 km

Availability: May 2002 to present

Coverage: Global

AMSR-E data include brightness temperatures, soil moisture, ocean products (water vapor, cloud liquid water, sea surface temperature), rain, snow, and sea ice in both swath and gridded formats.

Validation Data

AMSR-E Validation Data

Resolution: Variable

Availability: 2002 to 2005

Coverage: Iowa, Oklahoma, Georgia, Alabama, Arizona, Mexico, and Brazil

The AMSR-E validation effort addresses data quality through comprehensive calibration and validation programs. These programs characterize the accuracy and precision of AMSR-E observations and their derived products, and provide for the assessment and refinement of algorithm performance for the standard AMSR-E products.

Cold Land Processess Experiment

Resolution: Variable

Availability: 2002 and 2003

Coverage: Northern Colorado and southern Wyoming

The Cold Land Processes Experiment (CLPX) is a multi-sensor, multi-scale field program designed to extend the current local-scale understanding of water fluxes, storage, and transformations to regional and global scale. Using ground, airborne, and spaceborne observations, the experiment emphasizes the development of a strong synergism between process-oriented understanding, land surface models, and microwave remote sensing.

Passive Microwave Products

Nimbus-7 SMMR and DMSP SMM/I

Resolution: 25 km

Availability: SMMR, 1978 to 1987; SSM/I, 1987 to present

Coverage: Polar regions

Scanning Multichannel Microwave Radiometer (SMMR) and Special Sensor Microwave/Imager (SSM/I) data include gridded brightness temperatures and sea ice type, extent, and concentration.

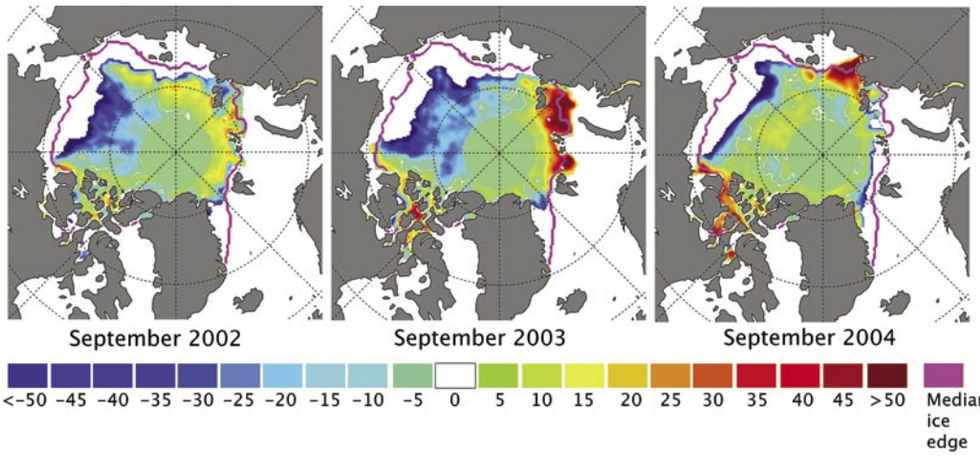
Near Real-Time SSM/I EASE-Grid Daily Global Ice Concentration and Snow Extent

Resolution: 25 km

Availability: January 2000 to present

Coverage: Polar regions

Near real-time maps are meant to provide a best estimate of current ice and snow conditions, based on information and algorithms available at the time the data were acquired.



Sea ice conditions for September 2002, 2003, and 2004, derived from the Sea Ice Index. Ice concentration anomaly images (the difference in estimated concentration from the mean) and the 1979-2000 median September ice edge (indicated by the pink line) are combined in each panel. For each year, the ice edge is well north of its median position off the coasts of Alaska and Siberia. There is a striking lack of sea ice off the east coast of Greenland, a feature noted for the first time in 2002. Anomalies are not calculated north of the circle centered over the pole (shown as light green) where satellites prior to 1988 provided no coverage <http://nsidc.org/data/seaice_index/>.

Northern Hemisphere EASE-Grid Weekly Snow Cover and Sea Ice Extent, Version 2

Resolution: 25 km

Availability: 1966 to 2001 and 1978 to 2001

Coverage: Northern Hemisphere

This data set combines snow cover and sea ice extent at weekly intervals for 1978 to June 2001, and snow cover alone for 1966 to June 2001.

Sea Ice Ancillary Products

NSIDC distributes a host of ancillary sea ice products, including ice extent, melt onset data, climatologies, ice persistence, total ice-covered area, and ocean masks <http://nsidc.org/data/smmr_ssmi_ancillary/>.

AVHRR Products

AVHRR Polar 1 Km Level 1B Data Set

Resolution: 1.1 km at nadir

Availability: 1992 to present

Coverage: Polar regions

This Advanced Very High Resolution Radiometer (AVHRR) data set provides nearly complete coverage of sea ice, land ice, and land in polar regions at 1.1-km resolution for all five bands of the AVHRR sensor.

AVHRR Polar Pathfinder Twice-Daily EASE-Grid Composites

Resolution: 1.25, 5, and 25 km

Availability: 1992-1998 (1.25 km), 1981-1998 (5 km), 1981-2000 (25 km)

Coverage: Polar regions

These data sets are a collection of products for both poles, consisting of twice-daily gridded and calibrated satellite channel data and derived parameters. The parameters include average albedo and skin temperature, solar zenith angle, surface type mask, cloud mask, cloud fraction files, and others. Data are in 1-byte and 2-byte integer gridded format.

Altimetry and Elevation Data

Ice, Cloud, and Land Elevation Satellite (ICESat) Geoscience Laser Altimeter System (GLAS)

Resolution: 60-m spot size at nadir

Availability: Begins Feb. 2003; see release schedule for availability <http://nsidc.org/data/icesat/data.html>.

Coverage: Global, from 86° N to 86° S latitude

The main objective of the ICESat mission is to measure ice sheet elevations and changes in elevation through time. Secondary objectives include measurements of cloud and aerosol height profiles, land elevation, vegetation cover, and sea ice thickness.

RAMP Digital Elevation Model (DEM) Version 2

Resolution: 200 m, 400 m, and 1 km

Availability: Collected between 1940s and 2000

Coverage: Antarctica, from 60° S to 90° S latitude

This high-resolution RADARSAT Antarctic Mapping Project (RAMP) DEM combines topographic data from a variety of sources to provide consistent coverage of all of Antarctica.

Greenland 5 km DEM, Ice Thickness, and Bedrock Elevation Grids

Resolution: 5 km interpolated, but true horizontal resolution varies according to slope and surface characteristics

Availability: Collected between 1970s and 1990s

Coverage: Greenland

A Digital Elevation Model (DEM), ice thickness grid, and bedrock elevation grid of Greenland are available in ASCII text format at a 5 km grid spacing in a polar steriographic projection.

Polar Atmospheric Data

Historical Arctic and Antarctic Observational Data

Availability: Varies by station, 1913 to 2002

Coverage: Arctic and Antarctic

This product consist of meteorological data from 105 Arctic weather stations and 137 Antarctic stations. Variables include wind direction, wind speed, visibility, air temperature, dew point temperature, and sea level pressure. Temporal coverage varies by station, with the earliest record in 1913 and the latest in 2002.

Additional Products

The NSIDC DAAC and its host, National Snow and Ice Data Center, distribute data sets and products acquired outside EOSDIS. Data subjects include permafrost, frozen ground, glaciers, ice shelves, icebergs, ice sheets, snow cover, ice velocity, and ocean chemistry and temperature.

Data Tools

NSIDC distributes a variety of data manipulation tools for specific data types. It also has tools for searching, ordering, and subsetting gridded data <http://nsidc.org/data/tools/>.

Data Access

Data orders may be placed at the NSIDC DAAC through the EDG (see page 5-1).

Users may also access information about NSIDC data holdings through the online data catalog on NSIDC's Web site. Depending on the data set, NSIDC data products are available on a variety of media, including FTP, CD-ROM, 8-mm tape, DVD, and DLT.

For assistance or additional information, contact

NSIDC DAAC User Services
National Snow and Ice Data Center University of Colorado

Phone: +1 303–492–6199
Fax: +1 303–492–2468
E-mail: nsidc@eos.nasa.gov or nsidc@nsidc.org
URL: http://nsidc.org

ORNL DAAC Oak Ridge National Laboratory DAAC

- Biogeochemical Dynamics
- Ecological Data
- Environmental Processes

The ORNL DAAC provides data and information about the dynamics between the biological, geological, and chemical components of Earth's environment. These dynamics are influenced by interactions between organisms and their physical surroundings, including soils, sediments, water, and air.

Available Data

Field Campaign Data

Boreal Ecosystem-Atmosphere Study (BOREAS) and BOREAS Follow-On

Availability: Campaign data, 1993 to 1996 and 1993 to 1998; historical background data as early as 1937

Coverage: A 1,000- by 1,000-km study area with two sites in Manitoba and Saskatchewan, Canada

Through remote sensing and field measurements, BOREAS investigated exchanges of energy, water, heat, carbon dioxide, and trace gases between a boreal forest and the atmosphere.

First ISLSCP Field Experiment (FIFE) and FIFE Follow-On

Availability: Campaign data, 1987 to 1989 and 1987 to 1993; historical background data as early as 1858

Coverage: A 15- by 15-km study area in Kansas, U.S.A.

As part of the International Satellite Land Surface Climatology Project (ISLSCP), FIFE characterized exchanges of radiation, moisture, and carbon dioxide between a prairie site and the atmosphere.

Large-Scale Biosphere-Atmosphere Experiment in Amazonia (LBA)

Availability: Background data, 1972 to 1996

Coverage: Map and site data in the Amazon Basin

LBA data include gridded measurements of precipitation in Bolivia, Brazil, and Peru and Synthetic Aperture Radar (SAR) imagery from the rain forest region during 1995 and 1996.

Oregon Transect Ecosystem Research (OTTER)

Availability: Campaign data, 1989 to 1991; background data, 1989 to 1991

Coverage: Six sites in Oregon, U.S.A.

The OTTER project estimated fluxes of carbon, nitrogen, and water in three Oregon forests, using an ecosystem-process model and remote sensing data.

Southern African Regional Science Initiative (SAFARI 2000)

Availability: Campaign data, 2000; historical background data, 1879 to 2001

Coverage: Southern Africa, 5° W to 60° E; 5° N to 35° S

SAFARI 2000 studied the linkages between land and atmosphere processes in southern Africa, especially the relationship of biogenic, pyrogenic, and anthropogenic emissions and the functioning of the biogeophysical and biogeochemical systems.

Superior National Forest (SNF)

Availability: Campaign data, 1983 to 1984; weather data, 1972 to 1990

Coverage: 50- by 50-km study area in northern Minnesota, U.S.A.

SNF research investigated the usefulness of remote sensing data in estimating the biophysical properties (e.g., biomass) of a boreal forest.

Land Validation Data

Accelerated Canopy Chemistry Program (ACCP)

Availability: Campaign data, 1992 to 1993

Coverage: Sites in the continental U.S.A.

ACCP used remote sensing to study the nitrogen and lignin content of the vegetation canopy in various ecosystems.

EOS Land Validation

Availability: Campaign data, 1999 to present

Coverage: Global

The EOS Land Validation project is using the ORNL DAAC's Mercury system for registering data sets from ground-based and airborne measurements to compare with EOS satellite products.

Global Flux Tower Network ("FLUXNET")

Availability: Campaign data, 1990 to present

Coverage: Global

FLUXNET is compiling measurements of radiation, water vapor, carbon dioxide, and trace gas fluxes provided by regional networks and independent sites. Flux data are used to understand the mechanisms controlling the exchanges of carbon dioxide, water vapor, and energy across a spectrum of temporal and spatial scales to compare to EOS satellite products.

MODIS ASCII Subsets

Availability: February 2000 to present

Coverage: Global

Selected MODIS land products from the Terra and Aqua satellites are available for 280 sites. The products are subset for 7- x 7-km around the field sites. MODIS data are insinusoidal projection in ASCII format. Subset data can be viewed for individual composite periods or as a time series <http://www.modis.ornl.gov/modis/>.

Prototype Validation Exercise (PROVE)

Availability: 1997

Coverage: Jornada Experimental Range near Las Cruces, New Mexico, U.S.A.

PROVE collected land and atmospheric measurements to develop methods for validating satellite data. Measurements include surface reflectance, surface temperature, albedo, and leaf area index.

Regional and Global Data

Climate Collections

Availability: Varies, between 1753 and 1999

Coverage: Global

Data were measured or estimated for grid cells of various sizes. Holdings include historical climatology, mean climatology, and precipitation.

Hydroclimatology Collections

Availability: 1874 to 1988

Coverage: U.S.A. and U.S. territories

Hydroclimatic characteristics (e.g., streamflow, wetlands, precipitation, temperature) were measured at various sampling sites.

Net Primary Productivity (NPP)

Availability: Varies, between 1930 and 2001

Coverage: Global

NPP holdings contain field measurements and NPP estimates for a variety of ecosystems.

River Discharge (RivDIS)

Availability: Varies, between 1807 and 1991

Coverage: Global

Holdings contain long-term monthly averaged values for river discharge measured at various stations.

Soil Collections

Availability: Varies, between 1940 and 1996

Coverage: Global

Soil characteristics were measured at sampling sites or estimated for grids of various sizes.

Vegetation Collections

Availability: Varies, between 1932 and 2000

Coverage: Global and regional

Holdings pertain to vegetation characteristics, including the distribution of vegetation types, as well as leaf area index calculated from field measurements.

Vegetation/Ecosystem Modeling and Analysis Project (VEMAP)

Availability: Climate measurements, 1895 to 1993; climate scenarios, 1994 to 2100

Coverage: U.S.A.

VEMAP studied the global response of biogeography and biogeochemistry to variability in climate and other environmental factors (e.g., elevated atmospheric carbon dioxide concentrations).

Data Services

The ORNL DAAC Web site provides links to data centers that offer regional and global environmental data <http://daac.ornl.gov/rgd_datacenterslist.html>.

Users can also search the ORNL Mercury system to locate regional and global data held by other data centers <http://mercury.ornl.gov/ornldaac>.

The ORNL DAAC also offers three Web map servers to help users locate data from field sites from around the world. Users can select sites and retrieve information about site characteristics and available data for those sites.

This AirMISR image, covering a 9 x 9 km portion of northeastern South Africa, was acquired on September 7, 2000 from aboard the NASA ER-2 as part of the SAFARI 2000 field campaign. The project was conducted during 1999-2001 to develop a better understanding of the Earth-atmosphere-human system in southern Africa. This image was taken to characterize a prescribed fire in the Timbavati Private Game Reserve, near Kruger National Park. (Image from King et al. 2003. Remote sensing of smoke, land, and clouds from the NASA ER-2 during SAFARI 2000, Journal of Geophysical Research, Vol. 108.)

Data Access

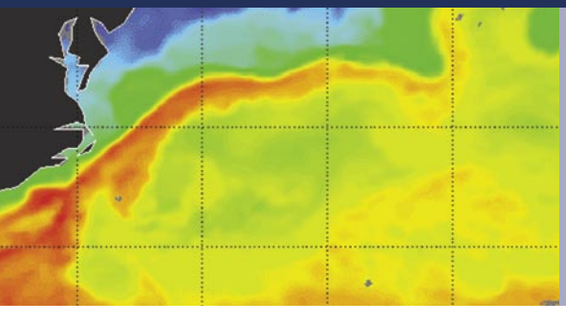
ORNL DAAC data are available through an online search-and-order system at www.daac.ornl.gov and through the EDG (see page 5-1).

For assistance or additional information, contact

ORNL DAAC User Services
Oak Ridge National Laboratory

Phone: +1 865–241–3952
Fax: +1 865–574–4665
E-mail: ornl@eos.nasa.gov or
ornldaac@ornl.gov
URL: http://www.daac.ornl.gov/

PO.DAAC Physical Oceanography DAAC – Jet Propulsion Laboratory



- Oceanic Processes
- Air-Sea Interactions

The NASA JPL PO.DAAC provides global oceanographic data from spaceborne instruments and produces higher level data products. Core holdings include ocean surface topography, ocean winds, and sea surface temperatures. Other holdings include data on significant wave height, ionospheric electron content, atmospheric moisture, and heat flux, as well as *in situ* data related to the satellite data.

Available Data

Ocean Surface Topography (OST)

TOPEX/POSEIDON

Resolution: Along track

Availability: 1992 to present

Coverage: Global

Data include sea surface height (SSH), wind speed, significant wave height, tropospheric water vapor, ionospheric electron content, and ancillary information along the satellite's track, from both NASA and CNES (French space agency) altimeters and radiometer. Products include the complete Merged Geophysical Data Record-B (MGDR-B), two reduced-volume sea surface height anomaly (SSHA) products, as well as near-real-time SSHA data from PO.DAAC's Near-Real-Time Image Distribution Server (NEREIDS).

Jason

Resolution: Along track

Availability: 2002 to present

Coverage: Global

Jason, the TOPEX/POSEIDON follow-on, is a joint French/U.S. mission to measure global sea surface topography along a 10-day repeat ground track. Data products include Operational Sensor Data Records (OSDRs), Interim Geophysical Data Records (IGDRs), Geophysical Data Records (GDRs), and SSHA products, as well as near-real-time SSHA data from NEREIDS.

Ocean Vector Winds

SeaWinds on QuikSCAT and SeaWinds on ADEOS-II

Resolution: Level 3 at 0.25 deg; Level 2B at 25 km

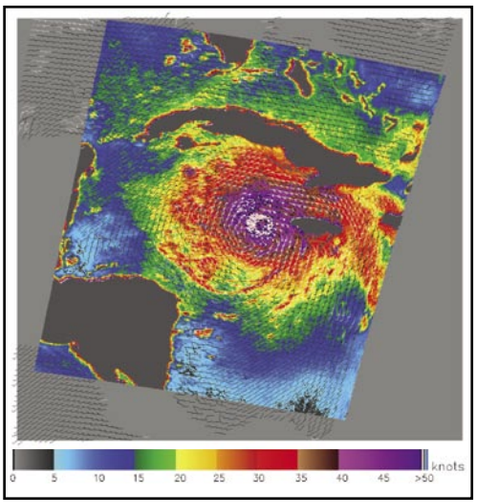
Availability: QuikSCAT, July 1999 to present; ADEOS-II, April 2003 to October 2003

Coverage: Global

Level 3 data sets from the SeaWinds instrument on both QuikSCAT and ADEOS-II provide daily gridded wind vectors, comprising zonal and meridional components. The Level 2B data sets provide per-orbit, swathed wind vectors, comprising speed and direction. SeaWinds orbits more than 14 times a day. Both products have ancillary data, e.g., rain flags and quality indicators.

SeaWinds Wind Stress

Resolution: Level 3 at 0.25 deg; Level 2B at 0.5 deg



Wind speeds topped 260 km/hour (160 mph) during Hurricane Ivan, September 2004. The purple in the center of the storm shows the highest wind speeds and the green around the outside shows the lowest. NASA image courtesy of the QuikSCAT team at JPL.

Availability: QuikSCAT, July 1999 to present; ADEOS-II, April 2003 to October 2003

Coverage: Global

The SeaWinds Level 3 and Level 2B wind stress products are derived from the Level 3 and the Level 2B wind vector products, respectively. Both products contain wind stress and drag coefficients from two algorithms, Liu & Tang and Large & Pond.

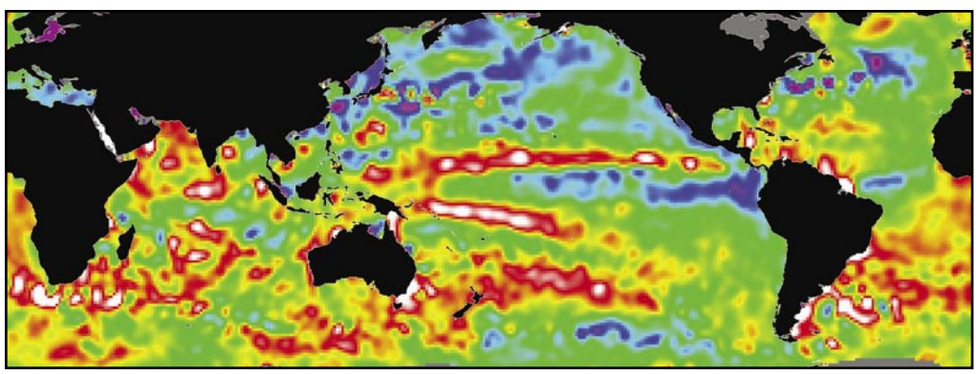
NSCAT

Resolution: Level 2 at 25 km and 50 km; Level 3 at 0.5 deg

Availability: September 1996 to June 1997

Coverage: Global

This NASA scatterometer data product includes 25-km wind vectors in native format (Level 2), daily 0.5- by 0.5-degree maps of selected wind vectors (Level 3), and 50-km swath data.



Global SSHA data from the Jason and TOPEX/POSEIDON tandem mission. Purple and blue represent below normal SSH, while green represents average SSH. Red and white indicate SSH more than 10 centimeters above normal.

Sea Surface Temperature (SST)

NODC/RSMAS version 5.0 AVHRR Pathfinder SST

Resolution: 4 km

Availability: 1985 to present

Coverage: Global

Latest version of the AVHRR Pathfinder product at 4 km global coverage. Data are available in 16-bit precision with a new improved land mask which allows for more retrievals along coasts and lakes. An ice mask is also now distributed with the SST data. Temporal resolution is daily, 8 day and monthly.

AVHRR MCSST

Resolution: 2.2 km, 9 km, and 18 km

Availability: 1981 to 2001 (Miami) and 2001 to present (NAVOCEANO)

Coverage: Global

SST products derived from Multi-Channel Sea Surface Temperature (MCSST) algorithms from the University of Miami and Naval Oceanographic Office (NAVOCEANO). The NAVOCEANO data include 2.2 km products for defined coastal areas.

MODIS SST

Resolution: 4.63 km, 36 km, and 1.0 deg

Availability: October 2000 to present

Coverage: Global

Daily, weekly, and monthly SST data from the Moderate Resolution Imaging Spectroradiometer (MODIS) on board Terra and Aqua are available in thermal IR and mid-IR products.

GOES SST

Resolution: 6 km

Availability: May 2003 to present, (GOES 10, 12); Oct. 2004 to present (GOES 9)

Coverage: 180–30° W, 45° S - 60° N (GOES 10, 12); 110° E-180° W, 42° S - 42° N (GOES 9)

SSTs are derived from NOAA's Geosta-tionary Operational Environmental Satellite (GOES) data and obtained at 1-, 3-, and 24-hour intervals.

GRACE Mission Data Products

The Gravity Recovery and Climate Experiment (GRACE) mission data products are available from August 2002 to June 2004. Level 2 data products are monthly gravity field estimates as well as mean gravity field models. These are provided as sets of spherical harmonic coefficients of the geopotential. Level 1B data contain inter-satellite range variations and all necessary corrections to derive monthly time-variations in Earth's gravity field.

Scatterometer Sigma0 Measurements

The normalized radar cross section (i.e., sigma0) measured by scatterometers convert to winds when gathered over the oceans. Sigma0s have proven useful in a variety of land and ice studies. Enhanced-resolution sigma0 products are available for ERS, NSCAT, and Seasat, and a browse product is available for QuikSCAT and SeaWinds.

Multiparameter and *In Situ* Data Products

In addition to the SSH, SST, and ocean wind products described, other *in situ* and multiparameter products are available, including significant wave height, chlorophyll *a* concentration, near-surface currents, atmospheric moisture, brightness temperature, and heat flux. Refer to the PO.DAAC online catalog for a full listing of these products.

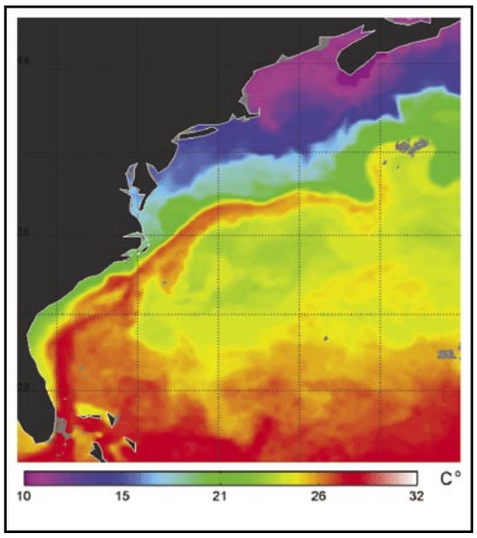
Data Tools and Services

PO.DAAC has a subsetting and visualization tool (POET), a near-real-time image distribution server (NEREIDS), and other tools and services <http://podaac.jpl.nasa.gov/dts>.

Future Data

GHRSST-PP

The GODAE High Resolution Sea Surface Temperature Pilot Project (GHRSST-PP) is an international collaboration to produce a new generation of global satellite-based SST measurements from infrared and microwave instruments. Level 2 Preprocessed (L2P) and Level 4 merged SST products containing satellite-specific SST error statistics and other relevant ancillary information (e.g., diurnal warming) will be available through a 30-day rolling store. A metadata repository database will facillitate search and discovery of GHRSST-PP products also archived at the NOAA NODC as well as provide access to matchups of coincident *in situ* and satellite SST observations.



Gulf Stream MCSST off the eastern coast of the United States. MCSST 2.2 km data are provided by NAVOCEANO.

Data Access

The PO.DAAC catalog of products can be accessed through the Web site. Investigators may subscribe to the PO.DAAC data-news bulletins. An online search-and-order service is also available through the EDG (see page 5-1).

For assistance or additional information, contact

PO.DAAC User Services
Jet Propulsion Laboratory

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FTP: podaac.jpl.nasa.gov

SEDAC Socioeconomic Data and Applications Center

- Population
- Sustainability
- Geospatial Data
- Multilateral Environmental Agreements

SEDAC is operated by the Center for International Earth Science Information Network (CIESIN), a unit of the Earth Institute at Columbia University based at Lamont-Doherty Earth Observatory in Palisades, New York. SEDAC's missions are to synthesize Earth science and socioeconomic data and information in ways useful to a wide range of decision makers and other applied users, and to provide an "Information Gateway" between the socioeconomic and Earth science data and information domains.

Available Data

Gridded Population of the World (GPW)

Resolution: 2.5-arc-minute grid

Availability: 1990, 1995, 2000, and 2015 (estimated)

Coverage: Global, continental, and national

In the GPW data set, the distribution of human population is converted from national or subnational units to georeferenced quadrilateral grids. Land area, population counts, and densities for each 2.5-arc-minute grid cell are available for the world, six continental regions, and individual countries. In addition, estimates of population in 2015 are available for continents and the globe. GPW raster (grid) data are available in three formats: ASCII text, ArcInfo interchange files (.e00), and binary band interleaved by line (.bil). Maps of administrative boundaries and population density are in portable document format (.pdf) and may be printed <http://sedac.ciesin.columbia.edu/gpw>.

Global Rural Urban Mapping Project (GRUMP)

Resolution: 30 arc-second grid

Availability: 1990, 1995, and 2000

Coverage: Global, continental, and national

The Global Rural Urban Mapping Project (GRUMP) data collection consists of three databases that build upon population datasets mostly from national statistical offices, satellite data and other representations of settlements. GRUMP Human Settlements is a global database of cities and towns of 1,000 persons or more, each represented as a point, and includes information on population and latitude and longitude coordinates. Populations were estimated for 1990, 1995, and 2000. The GRUMP Urban Extent Mask is the first systematic global-scale attempt to portray the boundaries of urban areas with defined populations of 5,000 and larger. The GRUMP Population Grid represents the distribution of human population across the globe, accounting for urban population concentration more precisely than previous efforts. In addition to the data, printable maps of human settlements (continents only) and urban extents are available <http://sedac.ciesin.columbia.edu/gpw>.

Population, Landscape, and Climate Estimates (PLACE)

Resolution: National

Availability: 1990, 1995, and 2000

Coverage: Global

In the PLACE data set, population and territorial extent are overlaid with biophysical parameters such as biome, climate, coastal proximity, elevation, population density, and slope. The resulting data set consists of an estimate of population and area (expressed as counts and percentages) for each of these parameters and is suitable for researchers who require tabular data aggregated to the national level <http://sedac.ciesin.columbia.edu/plue/nagd/place.html>.

China Dimensions Data Collection

Resolution: Includes administrative regions of China at 1:1,000,000

Availability: Varies by data set, from 1949 to 1991

Coverage: National, provincial, and county levels

China Dimensions is a rich collection of data resources for the People's Republic of China. Highlights include digital administrative boundaries, fundamental GIS layers, and county-level data on population, agriculture, economics, and hospitals <http://sedac.ciesin.columbia.edu/china>.

Environmental Sustainability Index (ESI)

Resolution: National

Availability: Reports issued in 2000, 2001, 2002, and 2005

Coverage: Global

The ESI provides a benchmark for the ability of nations to protect the environment over the next several decades. It does so by integrating data sets related to tracking natural resource endowments, past and present pollution levels, environmental management efforts, and a society's capacity to improve its environmental performance —into a set of indicators of environmental sustainability. The indicators permit comparison across the following fundamental components of sustainability: Environmental Systems, Environmental Stresses, Human Vulnerability to Environmental Stresses, Societal Capacity to Respond to Environmental Challenges, and Global Stewardship. Variable, indicator, component and index data are available <http://www.ciesin.columbia.edu/indicators/ESI/>.

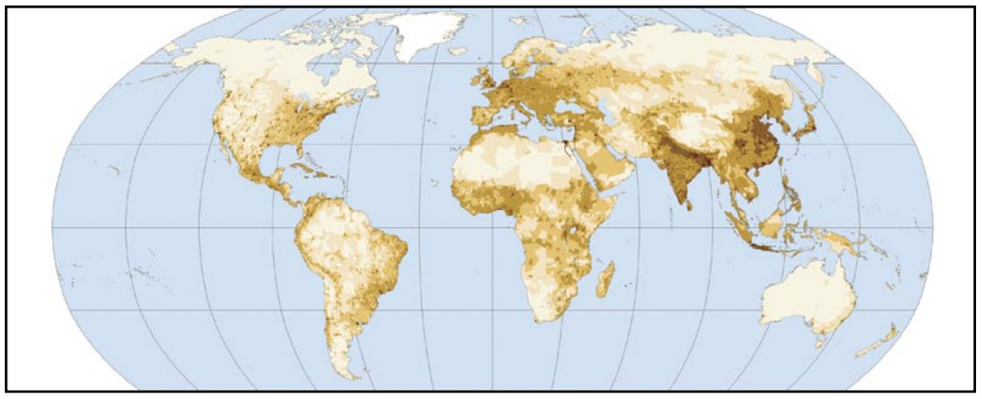
Human Footprint and Last of the Wild

Resolution: Subnational

Availability: Circa 1990s

Coverage: Global

Human influence on Earth's land surface is a global driver of ecological processes. The Human Footprint and Last of the Wild data sets are the result of a mapping project showing how humans directly influence the land surface. The Human Footprint map is based on geographic proxies for drivers of human impact such as human population density, land cover and land use mapping, lights



Gridded Population of the World provides estimates of human population density for each 2.5-arc-minute quadrilateral for the year 2000.

regularly visible from a satellite at night, locations of roads, rivers and coasts, and settlement patterns. Based on the Human Footprint data, the Last of the Wild maps are of areas representing the largest and relatively wildest places in each of their biomes <http://www.ciesin.columbia.edu/wild_areas/>.

Interactive Applications

Environmental Treaties and Resource Indicators (ENTRI)

ENTRI is a searchable relational database that contains international environmental treaties, treaty summaries, treaty status information, and global natural resource indicator data <http://sedac.ciesin.columbia.edu/entri>.

Potential Impacts of Climate Change on World Food Supply: Data Sets from a Major Crop Modeling Study

Resolution: National

Coverage: Global

Data on projected crop yield changes for major world regions based on climate model estimates, increased atmospheric carbon dioxide concentrations, and alternative adaptation scenarios are available via interactive queries. Information is provided on the study's methodology, inputs, and limitations, and on related links <http://sedac.ciesin.columbia.edu/giss_crop_study/index.html>.

U.S.-Mexico Demographic Data Viewer

This application provides rapid, interactive data mapping, viewing, and analysis of more than 200 socioeconomic variables that are congruent between the United States and Mexico. The U.S.-Mexico DDViewer is a useful tool for browsing and visualizing patterns at geographic levels ranging from regions to counties/municipios. This tool may be used to create customized maps of population, health, and other socioeconomic characteristics using a Java-enabled Web browser <http://plue.sedac.ciesin.columbia.edu/plue/ddviewer/ddv30-USMEX/>.

Special Report on Emissions Scenarios

Forty greenhouse gas emissions scenarios were prepared by the Working Group III of the Intergovernmental Panel on Climate Change for the IPCC's Third Assessment Report. The scenarios can assist in climate change analysis, including climate modeling and assessment of impacts, adaptation, and mitigation <http://sres.ciesin.columbia.edu>.

Information Resources

Assessments of Impacts and Adaptations to Climate Change (AIACC) in Multiple Regions and Sectors

The AIACC Web site provides access to data, software, and bibliographies related to climate impacts, adaptation, and vulnerability across multiple sectors. The Data, Methods, and Synthesis Activity is part of the AIACC Program. The Web site synthesizes information on the sectors, systems, and groups studied; methods utilized; and results of the 24 AIACC projects <http://sedac.ciesin.columbia.edu/aiacc/>.

Thematic Guides on the Human Dimensions of Global Environmental Change

Thematic Guides offer overviews of several issues that pertain to human interactions in the environment and global change. They give researchers, policy makers, educators, and the public quick access to background materials on global change issues, and to locate data sets and information resources. Guides are available for Social Science Applications of Remote Sensing; Land-Use and Land-Cover Change; and Global Population Projections <http://sedac.ciesin.columbia.edu/tg/guide_main.jsp>.

Urban Remote Sensing Studies

The following Web page groups together SEDAC-sponsored publications and reports that focus on remote sensing applications in urban areas, and provides links to other resources <http://sedac.ciesin.columbia.edu/urban_rs/>.

Data Access

SEDAC Data and Information Catalog Services

SEDAC has developed an electronic gateway to provide access to the catalogs of a diverse international group of data archives and other institutions available at http://www.gateway.ciesin.columbia.edu/.

For assistance or additional information, contact

SEDAC User Services
CIESIN at Columbia University

Phone: +1 845–365–8920
Fax: +1 845–365–8922
E-mail: sedac@eos.nasa.gov or
ciesin.info@ciesin.columbia.edu
URL: http://sedac.ciesin.columbia.edu

Section 5

DAAC Data Search and Order

The data centers are responsible for data archival, product development and distribution, and user support. Each data center is distinguished from one another by their specific Earth system science disciplines. In addition to the search-and-order capabilities provided by the EDG, the data centers have individual online systems that allow them to provide unique services for users of a particular type of data. The center-specific systems emphasize data products, services, and data-handling tools unique to the data center.

The data centers provide their users with the following services and information.

- ***Data center services***
  - – Center-unique search-and-order systems
  - – Specific Earth science discipline searches
  - – Specialized data set tools

- ***User services***
  - – Assistance in selecting and obtaining data
  - – Access to data-handling and visualization tools
  - – Notification of data-related news
  - – Technical support and referrals

For more information about the data centers and their data and services, see http://nasadaacs.eos.nasa.gov.

EOS Data Gateway (EDG)

The EDG is the primary access point to EOSDIS and other Earth science data holdings archived at the EOSDIS data centers and several international data centers. The goal of the EDG is to provide seamless, online access to these archives.

The EDG search-and-order tool provides access to more than 2,100 data sets held at 19 data centers. This system allows users, including those without specific knowledge of the data, to search science data holdings, retrieve high-level descriptions of data sets and detailed descriptions of the data inventory, view browse images, and place orders for data products. This system is accessible on the Web at http://eos.nasa.gov/imswelcome.

The EDG search-and-order tool has the following features:

- ***Browse capability***—Allows a user to explore the list of data sets or granules returned by a search by viewing their temporal coverage, spatial coverage, attributes (metadata), related documents (guide search), and browse images.

- ***Order function***—Allows the user to select data for ordering, choose packaging information, enter ordering information (such as shipping address), and place an order.

- ***EOS and related search and access tools***—Provides links to other search and access resources for EOS and related data.

Global Change Master Directory (GCMD)

The GCMD provides information to assist users in locating EOS and other Earth science data sets and services. The GCMD holds Earth science data set and service descriptions that provide vital information to help determine whether the data or service meets the user's needs. Descriptions include information such as location of the data or service, associated investigators and other contacts, spatial and temporal coverage of the data, resolution of the data, and links to the actual data or service.

The GCMD database contains more than 15,200 Earth science data set descriptions, and approximately 2,500 new descriptions are added annually. The GCMD database also contains more than 1,100 Earth science services (software, analytical tools, models, educational resources, etc.), and

grows by approximately 200 new service descriptions annually. More than 28 percent of the GCMD database refers to data from NASA's EOS missions and Earth Science Information Partner (ESIP) data providers. More than 2,400 data providers contribute to the GCMD database. The GCMD directory of data and services is available online at http://gcmd.nasa.gov.

The GCMD database can be searched for EOSDIS data sets by using free-text or an extensive set of keywords covering all areas of Earth science research including the atmosphere, biosphere, hydrosphere and oceans, snow and ice, geoscience, paleoclimatology, land surface, and human dimensions of global change. Data sets can also be searched by platform (or spacecraft), instrument, data center, geographic location, or project. For example, a user may conduct a search for all data sets from Terra or for data sets collected by the MODIS instrument. If a data set exists in the EDG, a special link will connect the user directly from the description to the EDG so that the data can be browsed or ordered. Other links will direct the user to online data, documentation, and other information.

Earth science-related services are also searchable from http://gcmd.nasa.gov/services/. Examples range from specialized tools for browsing, manipulating, and visualizing EOS data products to Earth science educational products and environmental hazard advisory services. Users can search the services database using controlled keywords or free-text to discover data-set-specific tools.

Note: Use the GCMD to search for information about data and services. To order EOSDIS data, use search-and-order systems such as the EDG or DAAC-specific systems.

Federation Interactive Network for Discovery (FIND)

The FIND Web-based system serves as the user interface for accessing data within the NASA Earth Science Information Partner (ESIP) Federation. Users are able to locate data and information held by members of the Federation. (DAACs are Type 1 ESIPs.) The Federation partners bring together government agencies, universities, nonprofit organizations, and businesses in an effort to make Earth science information available to a broader community. An objective of the Federation is to evolve methods that make Earth science data easy to preserve, locate, access, and use for all beneficial applications. For more information about the ESIP Federation and member organizations, see http://www.esipfed.org/.

FIND incorporates EOSDIS data available from the DAAC Alliance data centers as well as data from other Federation members. FIND is based on the Mercury system (see page 6-7) and available on the Web at http://mercury.ornl.gov/esip.

Section 6

Many of the data sets available from the DAACs require the use of special tools for image processing and analysis. These tools were created either within the data centers or by external software developers and data users. The Data Tools Web page gives information about the tools and provides links to data tool Web pages for many of the data centers <http://nasadaacs.eos.nasa.gov/tools.html>.

The data centers also provide center-unique tools for functions such as searching and subsettting data. The table below lists and describes some of the data-handling and service tools available from the DAACs.

Data Center	Data Tool/Service	Description
ASF DAAC	SAR Software Tools	The ASF software tools are designed to make it easier for users to process ASF data products and translate them into a variety of other formats. A graphical user interface exists which guides the user through the process of ingesting, geocoding, and exporting datasets. The tools can ingest most Level 1 ASF products, and produce geocoded (or ungeocoded) GeoTIFF, TIFF, JPEG, or portable pixmap images. The ASF software tools can be downloaded via ftp from http://www.asf.alaska.edu/software/index.html. The same page also provides access to tutorials on the ASF software tools and the ASF Forum, a place for the user community and ASF staff to interact with each other online about technical topics related to ASF data, ASF software tools, SAR applications and other issues.
GES DAAC	Online Analysis Tools • Giovanni	The GES DAAC provides tools for online analysis of various Earth science data products. The GES-DISC Interactive Online Visualization and Analysis Infrastructure (Giovanni) is the underlying infrastructure for a growing family of Web interfaces that allows users to analyze gridded data interactively online without having to download any data. Through Giovanni, users are invited to discover and explore our data using sophisticated analyses and visualizations. The following Giovanni instances are currently available: Ocean color, Atmospheric, MODIS, and TRMM. http://disc.gsfc.nasa.gov/techlab/giovanni/
	Data Tools • AIRS Online Channel/Variable Subsetter	Many tools are available to handle HDF and HDF-EOS data. http://disc.gsfc.nasa.gov/tools/ The AIRS subsetter provides channel and/or variable subsetting of Level 1B and Level 2 data products. The subset files are staged on an anonymous FTP site and the user is notified to download the output files.
	• READ_HDF	This command-line program allows a user to view the contents of an HDF file, as well as subset the data therein. Data can be subset along any dimension, or the entire data can be dumped if no subset options are given. There is also a mode to print a hierarchical tree list of the objects in the file. Data can be sent to an ASCII text file, a set of flat binary files, or displayed on the screen (default).
	•HE5Subset	A command line C program for viewing the contents of an HDF-EOS5 file, and subetting the data within. Any of the HDF-EOS5 objects (Grid, Point, Swath, ZA) within a file and their data fields can be listed. Files may be subset by parameter, spatially, and/or temporally, or along any other field or dimension.

Data Center	Data Tool/Service	Description
GES DAAC (continued)	WHOM	The Web-based Hierarchical Ordering Mechanism (WHOM) is a search-and-order system that allows the user to search the GES DAAC data archive in several ways: (1) Data Pool, which allows the user to search most frequently requested data sets, (2) Earth science data type, and (3) data set. WHOM has the following functionalities: • Attribute filtering—Users can search by using spatial, temporal, parameter (Ocean Level 3), and day/night flag criteria. • Ocean parameter subsetting—This function is implemented for Level 2 and Level 3 data. Users can select and order only the parameters they need. For Level 2, the subset file incorporates all requested parameters, corresponding quality arrays, and geolocation arrays. • On-demand channel/band subsetting—Users request only the channels (bands) they need from Level 1B calibrated radiances. This function is implemented for MOD021KM and MYD021KM data. http://disc.gsfc.nasa.gov/data/
GHRC	HyDRO	The Hydrologic Data Search, Retrieval, and Order (HyDRO) system allows the user to search data set holdings at GHRC. HyDRO provides a list of GHRC data sets specific to the user's requirements. Users are able to browse the online information and tools or services for each data set. They can download online data sets by FTP or place an order. http://ghrc.msfc.nasa.gov/hydro-cgi-bin/execute?hydro+search
	Data Pool	The GHRC Data Pool provides on-line access to half a terabyte of passive microwave data <http://datapool.msfc.nasa.gov/>. • Multiple views of available data, e.g. search, ftp and calendars • Data search based on product, instrument, platform and date • SSM/I, TMI, and AMSU-A Coarse Grain Subsetting • Shopping cart style order creation • Automated order packaging for FTP delivery • Integration with GHRC Order Tracking System for metrics and user services support • Direct FTP access to online data sets • DODS/OPeNDAP data access • Web Mapping Services
	Coincidence Search Engine	The Coincidence Search Engine may be used to search for times when up to four satellites were over or within the same geographic area simultaneously. Searches may be constrained by time, geographic area, and/or distance between the satellites. The output consists of a sequence of text lines listing the date, time, satellite name, and latitude and longitude. http://ghrc.msfc.nasa.gov/orbit-cgi-bin/execute?orbit+concur
	Coarse Grain Subsetter	With the use of special internal coverage files, this tool provides a very quick retrieval of the passes in the user's area of interest. The subsetter can be used on SSM/I, AMSU-A, and TMI data. It is available on the GHRC Data Pool and through User Services for SSM/I data that is not available on the Data Pool. http://datapool.msfc.nasa.gov/

Data Center	Data Tool/Service	Description
GHRC (continued)	HDF-EOS Subsetter	The HDF-EOS Subsetting Engine (HSE), a dataset-independent subsetting service for HDF-EOS data, provides robust, operational subsetting software, available for use within EOSDIS and by the science community. HSE supports both HDF-EOS (based on HDF 4) and HDF-EOS 5 (based on HDF 5) data formats. HSE-based products include the HDF-EOS Subsetting Appliance (HSA) for integration with ECS data order Processing, a simplified stand-alone subsetting tool called "hewbe", and a subsetting web service (in work). http://subset.itsc.uah.edu/hew/
	SPOT	A companion program to HSE, SPOT can be used to check HDF-EOS files for subsettability by HSE. SPOT is invoked using a simple command-line interface. It checks that • The file exists and is readable • The file is in HDF format • The file is in HDF-EOS format • The file contains valid HDF-EOS structures • The file contains the metadata needed for subsetting http://www.subset.org/tools_docs/sds-spot.html
	Algorithm Development and Mining System (ADaM)	(ADaM) applies data mining technologies to remotely-sensed and other scientific data. ADaM's mining and image processing toolkits consist of interoperable components that can be linked together in a variety of ways for application to diverse problem domains. ADaM has over 75 autonomous components that can be configured to create customized mining processes to provide pattern recognition, image processing, optimization, and association rule mining capabilities. Each component is provided with a C, C++, or other application programming interface (API), an executable in support of generic scripting tools (e.g. Perl, Python, shell scripts) and eventually web service interfaces to support distributed architectures including web and grid applications. Preprocessing and analysis utilities aid users in applying data mining to their specific problems. http://datamining.itsc.uah.edu/adam/
	Web Mapping Services	An OGC-compliant web map service is available on the GHRC Data Pool that maps AMSU-A, TMI, and SSM/I data based on specific spatial and temporal request criteria. A web map service returns the image of one specific data layer that users/applications can then overlay or merge with other data layers to create composite maps. http://www.itsc.uah.edu/discover/wms.html
	NLDN Subsetter	The NLDN Subsetter, needs only the latitude and longitude of a geographic box along with the time period of interest to greatly reduce the volume of National Lightning Detection Network data. The subsetter will zip through the entire NLDN dataset for the time period designated, and repackage the data into daily files which contain only those lightning events which occur in the user defined box. http://www.subset.org/tools_docs/sds-nldn.html **Note: Distribution of NLDN data is restricted to Earth Observing System (EOS) and TRMM affiliated investigators. When contacting the GHRC for the first time with request for NLDN data, please provide your NASA contract number.**
	NLDN Movie Maker	Animated movies of lightning events for a user-specifed area from the NLDN datasets can be custom generated. http://thunder.msfc.nasa.gov/data/#NLDN_DATA **Note: Distribution of NLDN data is restricted to Earth Observing System (EOS) and TRMM affiliated investigators. When contacting the GHRC for the first time with request for NLDN data, please provide your NASA contract number.**

Data Center	Data Tool/Service	Description
LaRC DAAC	ASDC Data Pool	An on-line, short-term data cache providing a Web interface and FTP access to select ASDC data products. Specially subsetted and/or reformatted data products supporting field campaigns are also available. http://eosweb.larc.nasa.gov/HPDOCS/datapool/
	CERES Subsetting Tool	Allows subsetting of select CERES data products via the Java version of the ASDC Ordering Tool. The data can be subset by latitude and longitude, start and end time, parameter, and criterion. http://eosweb.larc.nasa.gov/JORDER/ceres.html
	hdfscan	A data browser for files in Hierarchical Data Format (HDF), and HDF Earth Observing System (EOS) extension (HDF-EOS) formats. It is specifically written to facilitate access to Terra MISR data products. In particular, many MISR-unique functions are incorporated into the tool, such as data scaling, reformatting, unpacking, fill value recognition, and flag value interpretation. However, because of the standard formats provided by HDF and HDF-EOS, hdfscan can also serve as a general purpose tool for use with any other files making use of these formats. http://eosweb.larc.nasa.gov/PRODOCS/misr/tools/hdfscan.html
	Image Gallery	The ASDC Imagery Gallery provides access to images and color graphics of AirMISR, CERES, MISR, NVAP, POAM II, and SSM/I data products. http://eosweb.larc.nasa.gov/HPDOCS/imagery.html
	MISR Browse Tool	Allows easy access to images from the MISR instrument. The browse images are produced from the ellipsoid product for each camera, reduced to 2.2 km resolution. The MISR red, green, and blue bands are used to create a color image, which has been intentionally clipped and gamma-stretched to make cloud, ocean, and land features visible. The images are JPEG format. http://eosweb.larc.nasa.gov/MISRBR/
	MISR ENVI Tool	Imports MISR Level 1B2 Ellipsoid and Terrain stacked block data into ENVI, allows automatic geolocation and correctly interprets band information. The tool consists of a set of routines written in Research Systems, Inc. IDL programming language which implement an ENVI User Function for working with MISR L1B2 data. MISR map projection definitions are provided for augmenting the ENVI defined map projections file, and a sample ENVI menu file which adds a menu item to invoke this tool is also included. http://eosweb.larc.nasa.gov/PRODOCS/misr/tools/envi_tool.html
	MISR Level 3 Imagery	Visualization of parameters contained in the MISR Level 3 global data products such as radiances, aerosol optical depth, surface reflectance, and vegetation indices are available. The Level 3 products are averages of select Level 1 and Level 2 parameters over daily, monthly, seasonal and annual time periods. MISR Level 3 data are available for viewing, animating, and downloading from the Web. http://eosweb.larc.nasa.gov/PRODOCS/misr/level3/overview.html

Data Center	Data Tool/Service	Description
LaRC DAAC (continued)	MISR Subsetting and Reformatting Tool	Allows subsetting and reformatting of MISR data ordered through the EDG. The data can be subset by latitude and longitude, MISR block number, or parameter. This tool extracts the specified data and outputs a smaller file in the same format as the original file. This tool also allows the data to be reformatted in "Conventional HDF-EOS" grid from the original stacked block format. http://eosweb.larc.nasa.gov/PRODOCS/misr/subset_orders.html
	misr_view	A freely available IDL-based display and analysis tool, can be used with many types of MISR and AirMISR data. It was specifically designed for use with files that use the HDF-EOS "grid" interface. http://eosweb.larc.nasa.gov/PRODOCS/misr/tools/misr_view.html
	MOPITT Level 2 Viewer	IDL-based tool for creating plots of MOPITT Level 2 data products. http://eosweb.larc.nasa.gov/PRODOCS/mopitt/tools/moppitt_level2_viewer.html
	SAGE II Binary File Subset Tool	This software subsets SAGE II binary format files. The tool is written in Research Systems, Inc. IDL programming language. It can be run either with a licensed version of the IDL package or by using the IDL Virtual Machine freeware at <http://www.rsinc.com/idlvm/>. Subsets may be specified by latitude and longitude regions and/or by parameter. The selected subset is written to an ASCII output file along with header information for profiles that match the subset criteria. http://eosweb.larc.nasa.gov/PRODOCS/sage2/tools/subset_sage2_tool.html.
	view_hdf	A freely available IDL-based display and analysis tool for accessing data stored in HDF and HDF-EOS format. Variables from either Science Data Sets or vdata structures in a HDF file, can be subset, rendered as two and three-dimensional graphics, and plotted as geolocated data onto various world map projections. Other features include multiple variable plots, difference plots, and simple statistics. http://eosweb.larc.nasa.gov/HPDOCS/view_hdf.html
LP DAAC	GloVis	The USGS Global Visualization Viewer (GloVis) allows users to search, browse, and order ASTER and MODIS data. Users click on a global locator map to view ASTER or MODIS images for their selected geographic area. http://glovis.usgs.gov/
	Data Pool	The Data Pool at the LP DAAC is an online archive that provides FTP access to select ASTER and MODIS data products. ASTER Data Pool coverage includes the United States and U.S. Territories. MODIS coverage is global. The Data Pool HDF-EOS to GeoTiff (HEG) tool provides the ability to reformat, reproject, or spatially subset data. Several data types are available at no charge through the Data Pool. http://LPDAAC.usgs.gov/datapool/datapool.asp
	MODIS LDOPE Tools	The MODIS Land Data Operational Product Evaluation (LDOPE) software tools were developed to assist in the quality assessment of MODIS land products. These tools are invoked as standalone executables from a command-line interface. The software is supported on Irix, Solaris, Linux, and Windows operating systems. http://LPDAAC.usgs.gov/landdaac/tools/ldope/

Data Center	Data Tool/Service	Description
LP DAAC (continued)	MRT	The MODIS Reprojection Tool (MRT) enables users to read MODIS Level 2G, Level 3, and Level 4 land products in HDF-EOS format. The software supports spatial subsetting and spectral subsetting, performs geographic transformation to a different coordinate system or cartographic projection, and writes the output to file formats other than HDF-EOS (GeoTIFF, raw, binary). The MRT is supported on several platforms including SGI and Sun UNIX, Windows and Linux. http://LPDAAC.usgs.gov/landdaac/tools/modis/
	MRTSwath	The MODIS Reprojection Tool Swath (MRTSwath) provides the capability to transform MODIS Level 1B and Level 2 land products from HDF-EOS swath format to a uniformly gridded image that is geographically referenced. The software supports spatial subsetting and spectral subsetting, performs geographic transformations, and writes the output to file formats other than HDF-EOS (GeoTIFF, raw, binary). The MRTSwath is supported on several platforms including SGI and Sun UNIX, Windows and Linux. http://LPDAAC.usgs.gov/landdaac/tools/mrtswath/
	MODextract	MODextract is a software tool available for retrieving MODIS gridded products from the LP DAAC Data Pool and is executed from the end-user's machine. The MODextract is supported on IRIX, Solaris and LINUX. http://lpdaac.usgs.gov/landdaac/tools/datapool/
NSIDC	EASE-Grid Geolocation Tools	EASE-Grid tools include IDL routines and map projections for geolocation and conversion tools to use with EASE-Grid data sets. http://nsidc.org/data/ease/tools.html
	EOS-IT	The HDF-EOS Imaging Tool (EOS-IT) interface has two modes. One mode opens, geolocates, and visualizes multiple swath or grid products in separate but dynamically linked windows. Another mode allows users to examine individual bits from data fields. (Users must have IDL 5.6 to run EOS-IT.) http://nsidc.org/data/tools/eosit/
	GISMO	The Graphical Interface for Subsetting, Mapping, and Ordering (GISMO) Web-based tool can be used to search, subset, and order gridded data from NSIDC. Data may be queried by spatial range, temporal range, and data-specific parameters. http://nsidc.org/data/gismo
	IDL Visualizer	The IDL Visualizer reads data from an ICESat/GLAS file making the file viewable as graphical summaries of variables. http://nsidc.org/data/icesat/tools.html
	MS2GT	The MODIS Swath-to-Grid Toolbox (MS2GT) is a set of software tools that read HDF-EOS files containing MODIS swath data and produce flat binary files with gridded data in a variety of map projections. MS2GT consists of three Perl programs that make calls to several standalone IDL and C programs. Documentation for some products is in development. http://nsidc.org/data/modis/ms2gt/
	NGAT	The NSIDC GLAS Altimetry elevation extractor Tool (NGAT) extracts elevation and geoid data from GLAS altimetry products (GLA06 and GLA12-15) and outputs latitude, longitude, elevation, and geoid in ASCII columns. http://nsidc.org/data/icesat/tools.html

Data Center	Data Tool/Service	Description
NSIDC (continued)	PSQ	The Polar Spatial Query (PSQ) tool allows users to search for orbit and scene data sets by collection, parameter (channel), date, and region of interest. http://nsidc.org/data/psq
ORNL	FIND	The Federation Interactive Network for Discovery (FIND), based on the Mercury system, allows a user to locate data and information held by all members of the Federation of Earth Science Information Partners. http://mercury.ornl.gov/esip
	Mercury	Mercury is a Web-based system for searching metadata and retrieving selected data. Data and documentation can reside anywhere on the Internet, including in a data center or, for a project, on the individual data providers' servers. Mercury keeps the central metadata current by updating its database every night. Mercury supports international metadata standards and is compatible with Internet search engines. http://mercury.ornl.gov/ornldaac/
	MODIS ASCII Subsets Available	Users can select subsets of selected land products from the MODIS (Moderate Resolution Imaging Spectroradiometer) sensor for 280 field sites. These subsetted products, which are in ASCII format for a 7 x 7 km area centered on the field sites, are useful for tracking seasonal dynamics and for validating remote sensing products. Currently, 18 MODIS Land Products from MODIS sensors onboard the Terra and Aqua platforms are offered, along with a tool for creating graphs of single composite periods or time series of the entire period of record. http://www.modis.ornl.gov/modis/
	Map Server	Three Web map servers enable users to select sites for accessing net primary productivity, FLUXNET, and MODIS ASCII Subset data at the ORNL DAAC. The map servers help users find site-based data for locations around the world. Users "Query" the map and select a site or group of sites; the server provides links to the data sets associated with that site. Users can view one of seven map layers, zoom in on areas of interest, and query multiple sites. http://www.daac.ornl.gov/mapserver.shtml

Data Center	Data Tool/Service	Description
PO.DAAC	NEREIDS	The Near-Real-Time Image Distribution Server (NEREIDS) provides sea surface temperature, ocean surface topography, ocean vector winds, and land and sea ice satellite browse images within a few hours of capture. Binary data files are available for some images. Satellite missions include NOAA AVHRR, TOPEX/POSEIDON, Jason, and SeaWinds on QuikSCAT. http://podaac.jpl.nasa.gov/nereids
	Data Set Browse Image Tool	A Web-based calendar interface browse image tool may be used with the following PO.DAAC data sets to select and display browse images in GIF format: • SeaWinds on QuikSCAT • SeaWinds on ADEOS-II • NAVOCEANO MCSST L3 http://podaac.jpl.nasa.gov/dts/#Browse
	POET	Data subsetting and visualization for many PO.DAAC products are available from the PO.DAAC Ocean ESIP Tool (POET) Web-based interface. Output is returned as a latitude-longitude map, animation, time-series graph, or space-time profile. Output formats include: image (GIF, PNG, JPEG), scientific (HDF, netCDF), GIS (GeoTIFF, ArcGrid), binary (UNIX/Mac or PC), and ASCII. POET data also can be accessed by any Web Map Server (WMS) viewer. This feature enables you to combine or overlay POET data with data from any other source that complies with this standard. A sample viewer of POET data is available at http://viewer.digitalearth.gov. POET was developed by the Ocean ESIP (Earth Science Information Partner). http://podaac.jpl.nasa.gov/poet
SEDAC	DDViewer	The United States Demographic Data Viewer (DDViewer) allows a user to create maps and calculate statistics for 220 demographic variables from the 1990 U.S. Census. This tool maps states, counties, and census tracts. http://plue.sedac.ciesin.columbia.edu/plue/ddviewer
	ENTRI	The Environmental Treaties and Resource Indicators (ENTRI) is an online query of a relational database. http://sedac.ciesin.columbia.edu/entri
	U.S.-Mexico DDViewer	This interactive application provides rapid, interactive data mapping, viewing, and analysis of more than 200 socioeconomic variables that are congruent between the United States and Mexico. This tool is used for browsing and visualizing patterns at geographic levels ranging from regions to counties/municipios, and it may be used to map population, vital statistic, land area, and household data. http://plue.sedac.ciesin.columbia.edu/plue/ddviewer/ddv30-USMEX/

Section 7

NASA Portal

http://www.nasa.gov

This Web site provides the opportunity to learn more about NASA as an agency. Explore the many facets of NASA, from our administration and leadership, to our mission and vision for the future, to business, research and career opportunities.

NASA Science Mission Directorate

http://science.hq.nasa.gov

Recently NASA began the transformation of its Earth and space science programs by combining them into an integrated Science Mission Directorate. The new Directorate is closely involved in the Vision for Space Exploration through its support of science that both enables, and is enabled by, NASA's exploration activities. There are three science divisions in this Directorate accessible from this Web site along with links to agency level documents, Science Mission Education Program, multimedia, news stories, and many other items.

- Earth–Sun System Division
- Solar System Division
- Universe Division

NASA Earth–Sun System Division

http://science.hq.nasa.gov/earth-sun/

This site connects you to the program elements including research, missions, applied sciences, technology, and data archives.

NASA Earth–Sun System Division Earth Science Research Program

http://science.hq.nasa.gov/earth-sun/science/

NASA's goal in Earth science is to observe, understand, and model the Earth system to discover how it is changing, to better predict change, and to understand the consequences for life on Earth. We do so by characterizing, understanding, and predicting change in major Earth system processes and by linking our models of these processes together in an increasingly integrated way.

NASA Earth–Sun System Division Sun–Earth Connection Research Program

http://science.hq.nasa.gov/earth-sun/science/sun.html

Understanding the Sun, Heliosphere, and Planetary Environments as a single connected system is the goal of NASA's Earth–Sun System Division. In addition to solar processes, our domain of study includes the interaction of solar plasma and radiation with Earth, the other planets, and the Galaxy. Understanding the connections between the Sun and its planets will allow us to predict the impacts of solar variability on humans, technological systems, and even the presence of life itself.

NASA Earth–Sun System Division Missions

http://science.hq.nasa.gov/missions/earth-sun.html

From the vantage point above the Earth, we can view the Sun and Earth as a whole system, observe the results of complex interactions, and begin to understand how our planet and star are changing. Working with its domestic and international partners, NASA provides accurate, objective scientific data and analysis to advance our understanding of Earth-Sun system processes.

NASA Earth–Sun System Division Applied Sciences

http://science.hq.nasa.gov/earth-sun/applications/

The Applied Science program benchmarks practical uses of NASA-sponsored observations from Earth observation systems and predictions from Earth science models. NASA implements projects that carry forth this mission through partnerships with public, private, and academic organizations. These partnerships focus on innovative approaches for using Earth–Sun system science information to provide decision support that can be adapted in applications worldwide. This program focuses on applications of national priority to expand and accelerate the use of knowledge, science, and technologies resulting from the NASA goal of improving predictions in the areas of weather, climate, and natural hazards.

NASA Earth–Sun System Division Technology Office

http://science.hq.nasa.gov/earth-sun/technology/

The Earth–Sun System Technology Office (ESTO) demonstrates and provides technologies that can be reliably and confidently applied to a broad range of missions – for Earth and space science and exploration systems – as well as facilitate practical applications that benefit society at large. As the lead technology office within the Earth–Sun System Division of the NASA Science Mission Directorate, ESTO is focused on the technological challenges inherent in space-based investigations of our planet, our star, and their dynamic, interrelated systems.

NASA Earth–Sun System Division Earth Observing System Data and Information System (EOSDIS) Distributed Active Archive Centers (DAACs)

http://nasadaacs.eos.nasa.gov

DAACs represent the data management and user services arm of NASA EOSDIS. The data centers process, archive, document, and distribute data from NASA's past and current Earth-observing satellites and field measurement programs. Each center serves a specific Earth science discipline. This site provides information about the breadth and depth of data information, data products, data services and tools available to the Earth science community.

NASA Earth–Sun System Division National Space Science Data Center (NSSDC)

http://nssdc.gsfc.nasa.gov

NSSDC serves as the permanent archive for NASA space science mission data. "Space science" means astronomy and astrophysics, solar and space plasma physics, and planetary and lunar science. As permanent archive, NSSDC teams with NASA's discipline-specific space science "active archives" which provide access to data to researchers and, in some cases, to the general public.

NASA Funding Opportunities for Researchers, Applied Sciences, and Graduate Students

http://nspires.nasaprs.com/

Funding For Research and Applied Sciences

The NASA Research Announcement (NRA), entitled Research Opportunities in Space and Earth Sciences (ROSES) – 2005, solicits basic and applied research in support of the Science Mission Directorate (SMD). (Note: In August 2004, the SMD was formed by merging the former Office of Earth Science and Office of Space Science). This NRA covers all aspects of basic and applied supporting research and technology in space and Earth sciences, including, but not limited to: theory, modeling, and analysis of SMD science data; aircraft, stratospheric balloon, and suborbital rocket investigations; development of experiment techniques suitable for future SMD space missions; development of concepts for future SMD space missions; development of advanced technologies relevant to SMD missions; development of techniques for and the lab analysis of both extraterrestrial samples returned by spacecraft as well as terrestrial samples that support or otherwise help verify observations from SMD Earth science space missions; determination of atomic and composition parameters needed to analyze space data as well as returned samples from the Earth or space; Earth surface observations and field campaigns that support SMD science missions; development of integrated Earth system models; and the development of applied information systems applicable to SMD objectives and data.

Funding For Graduate Students

NASA Earth System Science Fellowship Program announces graduate student training fellowships for persons pursuing Master of Science (M.Sc.) or Doctoral (Ph.D.) degree in Earth System Science.

Funding For Post-Docs

The New Investigator Program in Earth Science encourages the integration of Earth system science research and education by scientists and engineers at the early stage of their professional careers.

NASA Education Program

http://www.nasa.gov/education/

NASA's commitment to education places special emphasis on increasing elementary and secondary education participation in NASA programs; enhancing higher education capability in science, technology, engineering, and mathematics (STEM) disciplines; increasing participation by underrepresented and underserved communities; expanding e-Education; and expanding NASA's participation with the informal education community. NASA Education supports education at all levels, with linkages to NASA research as a central part of our focus. The majority of NASA support to higher education is delivered through the Science and Technology (S&T) Missions. NASA Education supports the work of the S&T Missions by coordinating programs for students, faculty, and institutions that broaden the base of those who compete for NASA research awards.

NASA Science (Mission) Education Program

http://science.hq.nasa.gov/education/

NASA's Science Education Program creates products using NASA's results in Earth-Sun system science, solar system research, universe exploration, and the development of new technologies to support learning. The program sponsors educational activities at all levels of formal and informal education to provide opportunities for learners to investigate their world and their universe using unique NASA resources.

Image Galleries for the General Public, Educators, Students, and Researchers.

NASA Multimedia Gallery

http://www.nasa.gov/multimedia/highlights/

Provides a selection of images, video, and interactive features.

Science Mission Directorate Multimedia Gallery

http://science.hq.nasa.gov/multimedia/index.html

This web site links to all other core NASA Earth science and Space science image galleries. For example, it includes the NASA GSFC Scientific Visualization Studio (SVS) and the Visible Earth.

ASF DAAC–SAR Image Gallery

http://www.asf.alaska.edu/cgi-bin/ImageFolio3/imageFolio.cgi

This web site enables users to search for SAR images by keyword or by category (Interferometry, Land, Man and Environment, Ocean, and Topographic.)

GES DISC DAAC–Image Galleries

http://disc.gsfc.nasa.gov/gallery/index.shtml

This link takes you to the Goddard Earth Sciences Data & Information Services Center (GES DISC). The page contains links to recent hurricane images (Isabel, Bonny, Charley, Frances, Ivan),and Tropical Storm Gaston. There is also a link to Global Cloudmask images. Users have to register with the DAAC before they can view them.

LP DAAC–ASTER Image Gallery

http://asterweb.jpl.nasa.gov/gallery.asp

The Land Processes DAAC performs higher-level processing, archiving, and distribution of ASTER data. However, this link will take you to the Jet Propulsion Laboratory Web site on which the Image Gallery resides.

LaRC DAAC–MISR Image Gallery

http://eosweb.larc.nasa.gov/HPDOCS/misr/misr_html/misr_gallery_index.html

This link takes you to the MISR Image index. Images are organized into broad geographic regions, and then listed either by location or significant feature in the image.

LaRC DAAC–CERES Browse Images

http://eosweb.larc.nasa.gov/PRODOCS/ceres/browse/index.html

This link takes you to the CERES Browse Image index. Images are organized into three categories: ERBE-Like, TOA and Surface Products, and Atmosphere Products. Images are available from multiple platforms.

MOPITT Image Gallery

http://www.eos.ucar.edu/mopitt/dataimages/

This Web site provides links to articles and press releases which include MOPITT images. Also listed on the site are movies and animations of MOPITT data produced by various organizations.

NSIDC DAAC–Image and Photo Gallery

http://nsidc.org/gallery/

Links to data imagery, satellite imagery, historic photos, ice shelf and iceberg images and more are included in the NSIDC Image and Photo Gallery. The site also provides links to the NASA Earth Observatory and other sites.

Section 8

ACCP	Accelerated Canopy Chemistry Program
ACES	Altus Cloud Electrification Study
ACRIM	Active Cavity Radiometer Irradiance Monitor
ADaM	Algorithm Development and Mining System
ADEOS	Advanced Earth Observing Satellite
AIACC	Assessments of Impacts and Adaptations to Climate Change
AirMISR	Airborne Multi-angle Imaging SpectroRadiometer
AIRS	Atmospheric Infrared Sounder
ALT	Altimeter (TOPEX/POSEIDON)
AMPR	Airborne Passive Microwave Radiometer
AMSR-E	Advanced Microwave Scanning Radiometer-EOS
AMSU	Advanced Microwave Sounding Unit
AMSU-A	Advanced Microwave Sounding Unit A
ARESE	ARM Enhanced Shortwave Experiment
ASCII	American Standard Code for Information Interchange
ARB	Aerosol Research Branch
ASDC	Atmospheric Science Data Center
ASF	Alaska Satellite Facility
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
ATOST	Atlantic-THORpex Observing System Test
AVHRR	Advanced Very High Resolution Radiometer
AVIRIS	Airborne Visible/Infrared Imaging Spectrometer
BIL	Band Interleaved by Line
BOREAS	Boreal Ecosystem-Atmosphere Study
CALIOP	Cloud-Aerosol Lidar with Orthogonal Polarization
CALIPSO	Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations
CAMEX	Convection and Moisture Experiment
CaPE	Convection and Precipitation/ Electrification Experiment
CDR	Climate Data Record
CEOS	Committee on Earth Observation Satellites
CERES	Clouds and the Earth's Radiant Energy System
CFC	Chlorofluorocarbons
CIDC	Climatology Interdisciplinary Data Collection
CIESIN	Center for International Earth Science Information Network
CLAES	Cryogenic Limb Array Etalon Spectrometer
CLAMS	Chesapeake Lighthouse and Aircraft Measurements for Satellites
CLPX	Cold Land Processes Experiment
CLS	Cloud Lidar System
CNES	Centre National d'Etudes Spatiales
CODMAC	Committee on Data Management and Computation
CSA	Canadian Space Agency
CZCS	Coastal Zone Color Scanner
DAAC	Distributed Active Archive Center
DDViewer	Demographic Data Viewer
deg	Degree
DEM	Digital Elevation Model
DISCOVER	Distributed Information Services for Climate and Ocean products and Visualizations for Earth Research
DMSP	Defense Meteorological Satellite Program
DODS	Distributed Oceanographic Data System
EASE	Equal Area Scalable Earth
ECS	EOSDIS Core System
EDG	EOS Data Gateway
EDOS	EOS Data and Operations System
ENTRI	Environmental Treaties and Resource Indicators
EOS	Earth Observing System
EOSDIS	EOS Data and Information System
EOS-IT	HDF-EOS Imaging Tool
EP	Earth Probe
ERB	Earth Radiation Budget
ERBE	Earth Radiation Budget Experiment
EROS	Earth Resources Observation Systems
ERS	European Remote Sensing Satellite
ESA	European Space Agency
ESI	Environmental Sustainability Index
ESIP	Earth Science Information Partner
FIFE	First ISLSCP Field Experiment
FIND	Federation Interactive Network for Discovery

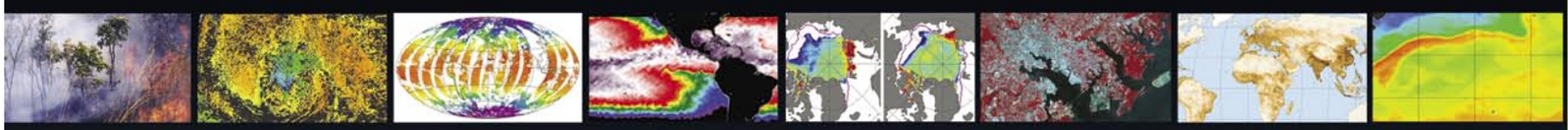
Acronyms and Abbreviations

FIRE	First ISCCP Regional Experiment
FIRE-ACE	First ISCCP Regional Experiment-Arctic Cloud Experiment
FLASHFlux	Fast Longwave And SHortwave radiation Fluxes
FLUXNET	Global Flux Tower Network
FOV	Field Of View
FTP	file transfer protocol
GAC	global area coverage
GBFM	Global Boreal Forest Mapping
GCMD	Global Change Master Directory
GDR	Geophysical Data Record
GEDEX	Greenhouse Effect Detection Experiment
GES	GSFC Earth Sciences
GHRC	Global Hydrology Resource Center
GHRSST-PP	GODAE High Resolution Sea Surface Temperature Pilot Project
GHz	gigahertz
Giovanni	GES-DISC Interactive Online Visualization and Analysis Infrastructure
GIS	Geographic Information System
GISMO	Graphical Interface for Subsetting, Mapping, and Ordering
GLAS	Geoscience Laser Altimeter System
GloVis	Global Visualization Viewer
GODAE	Global Ocean Data Assimilation Experiment
GOES	Geostationary Operational Environmental Satellite
GOTOPO30	Global 30-Arc-Second Elevation Data Set
GPS	Geophysical Processor System
GPW	Gridded Population of the World
GRACE	Gravity Recovery and Climate Experiment
GRFM	Global Rain Forest Mapping
GRUMP	Global Rural Urban Mapping Project
GSFC	Goddard Space Flight Center
GTE	Global Tropospheric Experiment
HALOE	Halogen Occultation Experiment
HDF	Hierarchical Data Format
HDF-EOS	HDF for the Earth Observing System
HE5Subset	HDF-EOS5Subset
HEG	HDF-EOS to GeoTiff
HEW	HDF-EOS Web-based (tool)
HIRDLS	High Resolution Dynamics Limb Sounder
HRD	Hurricane Research Division
HRDI	High Resolution Doppler Imager
HRPT	High Resolution Picture Transmission
HSA	HDF-EOS Subsetting Appliance
HSB	Humidity Sounder for Brazil
HSE	HDF-EOS Subsetting Engine
HyDRO	Hydrologic Data Search, Retrieval, and Order (tool)
IGDR	Interim Geophysical Data Record
ICESat	Ice, Cloud, and Land Elevation Satellite
IDL	Interactive Digital Language
IIR	Imaging Infrared Radiometer
InSAR	Interferometric Synthetic Aperture Radar
INTEX-NA	Intercontinental Chemical Transport Experiment-North America
IPCC	Intergovernmental Panel on Climate Change
IR	Infrared
ISAMS	Improved Stratospheric and Mesospheric Sounder
ISCCP	International Satellite Cloud Climatology Project
ISLSCP	International Satellite Land Surface Climatology Project
IWG	Investigator Working Group
JAXA	Japan Aerospace Exploration Agency
JERS	Japanese Earth Remote Sensing
JPL	Jet Propulsion Laboratory
km	Kilometer
LaRC	Langley Research Center
LASE	Lidar Atmospheric Sensing Experiment
LBA	Large-Scale Biosphere-Atmosphere Experiment in Amazonia

LDOPE	Land Data Operational Product Evaluation
LIDAR	Light Detection and Ranging
LIS	Lightning Imaging Sensor
LITE	Lidar In Space Technology Experiment
LP	Land Processes
m	Meter
MAPS	Measurement of Air Pollution from Satellites
MAS	MODIS Airborne Simulator
MCSST	Multi-Channel Sea Surface Temperature
MGDR-B	Merged Geophysical Data Record-B
MISR	Multi-angle Imaging SpectroRadiometer
MLS	Microwave Limb Sounder
MODIS	Moderate Resolution Imaging Spectroradiometer
MOPITT	Measurements of Pollution In The Troposphere
MRT	MODIS Reprojection Tool
MSU	Microwave Sounding Unit
NARSTO	North American Research Strategy for Tropospheric Ozone
NASA	National Aeronautics and Space Administration
NAVOCEANO	Naval Oceanographic Office
NCSA	National Center for Supercomputing Applications
NEREIDS	Near-Real-Time Image Distribution Server
netCDF	network Common Data Form
NGAT	NSIDC GLAS Altimetry elevation extractor Tool
NIR	Near Infrared
NLDN	National Lightning Detection Network
nm	Nanometer
NOAA	National Oceanic and Atmospheric Administration
NODC	National Oceanographic Data Center
NPP	Net Primary Productivity
NSCAT	NASA Scatterometer
NSIDC	National Snow and Ice Data Center
NVAP	NASA Water Vapor Project
OCO	Orbiting Carbon Observatory
OGC	Open Geospatial Consortium
OMI	Ozone Monitoring Instrument
OPenDAP	Open-source Project for a Network Data Access Protocal
ORNL	Oak Ridge National Laboratory
OSDR	Operational Sensor Data Records
OTD	Optical Transient Detector
OTTER	Oregon Transect Ecosystem Research
PAN	Panchromatic
PB	Petabyte
PEM	Particle Environment Monitor
PLACE	Population, Landscape, and Climate Estimates
PM-ESIP	Passive Microwave Earth Science Information Partner
POAM	Polar Ozone and Aerosol Measurement
PO.DAAC	Physical Oceanography Distributed Active Archive Center
POES	Polar Operational Environmental Satellite
POET	PO.DAAC Ocean ESIP Tool
POLDER	Polarization and Directionality of Earth's Reflectances
PR	Precipitation Radar
PROVE	Prototype Validation Exercise
PSQ	Polar Spatial Query (tool)
PSR	Polarimetric Scanning Radiometer
RAMP	RADARSAT Antarctic Mapping Project
REASoN	Research, Education, and Applications Solutions Network
RGPS	RADARSAT Geophysical Processor System
RivDIS	River Discharge
RSMAS	Rosenstiel School of Marine and Atmospheric Science
SAFARI	Southern African Regional Science Initiative
SAGE	Stratospheric Aerosol and Gas Experiment
SAR	Synthetic Aperture Radar
SCAR	Sulfates/Smoke, Clouds, and Radiation
SCF	Scientific Computing Facility
SDP	Standard Data Product
SDPS	Science Data Processing Segment

SeaWiFS	Sea-viewing Wide Field-of-view Sensor
SEDAC	Socioeconomic Data and Applications Center
SIM	Spectral Irradiance Monitor
SIPS	Science Investigator-led Processing System
SMMR	Scanning Multichannel Microwave Radiometer
SNF	Superior National Forest
SOLSTICE	Solar Stellar Irradiance Comparison Experiment
SORCE	Solar Radiation and Climate Experiment
SSE	Surface Solar Energy
SSH	Sea Surface Height
SSHA	Sea Surface Height Anomaly
SSM/I	Special Sensor Microwave/ Imager
SST	Sea Surface Temperature
SUCCESS	SUbsonic aircraft: Contrail Cloud Effects Special Study
SUSIM	Solar Ultraviolet Spectral Irradiance Monitor
SWIR	Shortwave Infrared
TARFOX	Tropospheric Aerosol Radiative Forcing Observational eXperiment
TB	Terrabyte
TCSP	Tropical Cloud Systems and Processes Terrabyte
TEFLUN	Texas and Florida Underflights
TES	Tropospheric Emission Spectrometer
THORpex	THe Observing-system Research and predictability experiment
TIM	Total Irradiance Monitor
TIR	thermal infrared
TIROS	Television and Infrared Observation Satellite
TMI	TRMM Microwave Imager
TOA	Top Of Atmosphere
TOGA-COARE	Tropical Ocean Global Atmosphere-Coupled Ocean Atmosphere Response Experiment
TOMS-EP	Total Ozone Mapping Spectrometer-Earth Probe
TOPEX	TOPography EXperiment
TOMS	Total Ozone Mapping Spectrometer
TOVS	TIROS Operational Vertical Sounder
TRMM	Tropical Rainfall Measuring Mission
UAH	University of Alabama in Huntsville
UARS	Upper Atmosphere Research Satellite
UAV	Uninhabited Aerial Vehicle
USGS	U.S. Geological Survey
UV	Ultraviolet
VEMAP	Vegetation/Ecosystem Modeling and Analysis Project
VIL	Volume Imaging Lidar
VIRS	Visible/Infrared Scanner
VIS	Visible
VNIR	Visible and Near Infrared
WFC	Wide Field Camera
WHOM	Web-based Hierarchical Ordering Mechanism
WINDII	Wind Imaging Interferometer
WMS	Web Map Server
XPS	Extreme Ultraviolet Photometer System

NP-2003-11-587-GSFC (Rev. 6/05)



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